Railway Age

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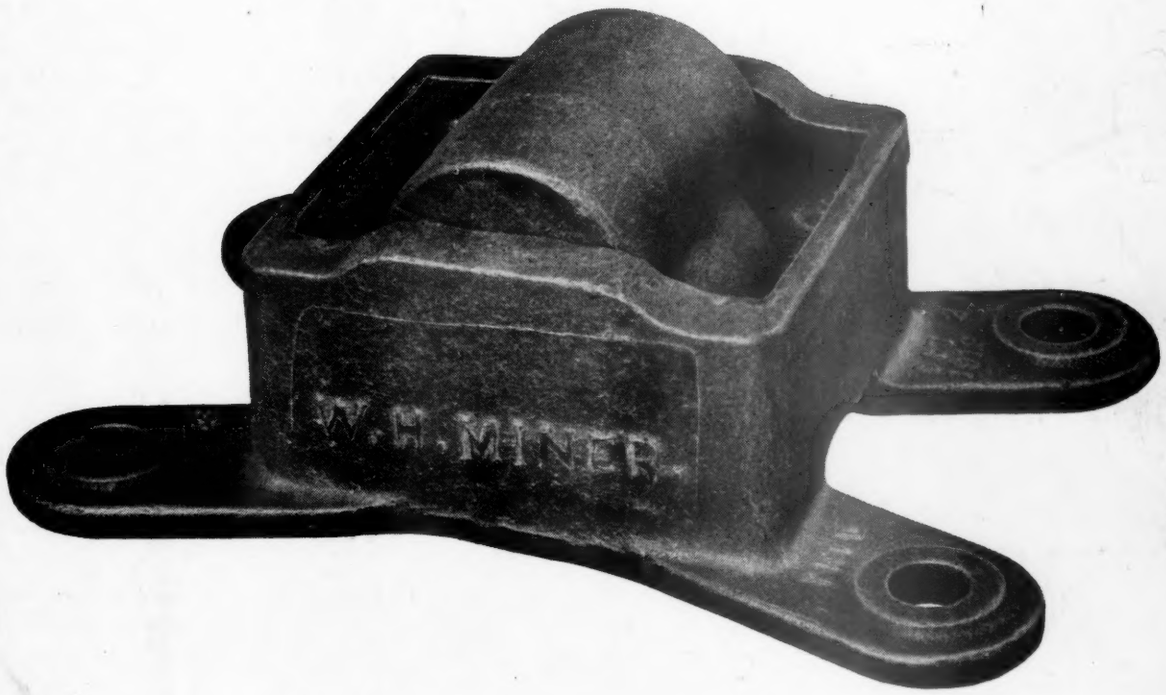
MINER

BALANCED SIDE BEARING



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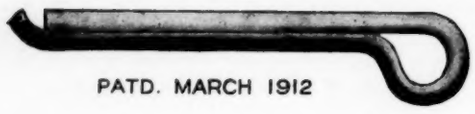

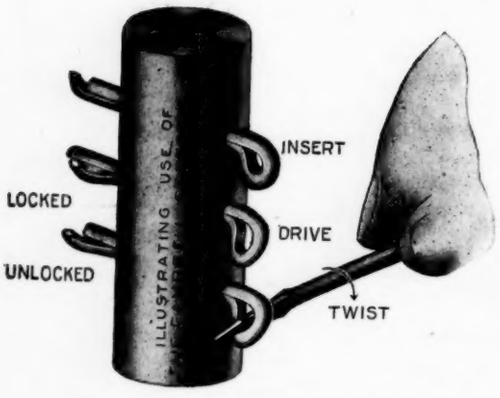

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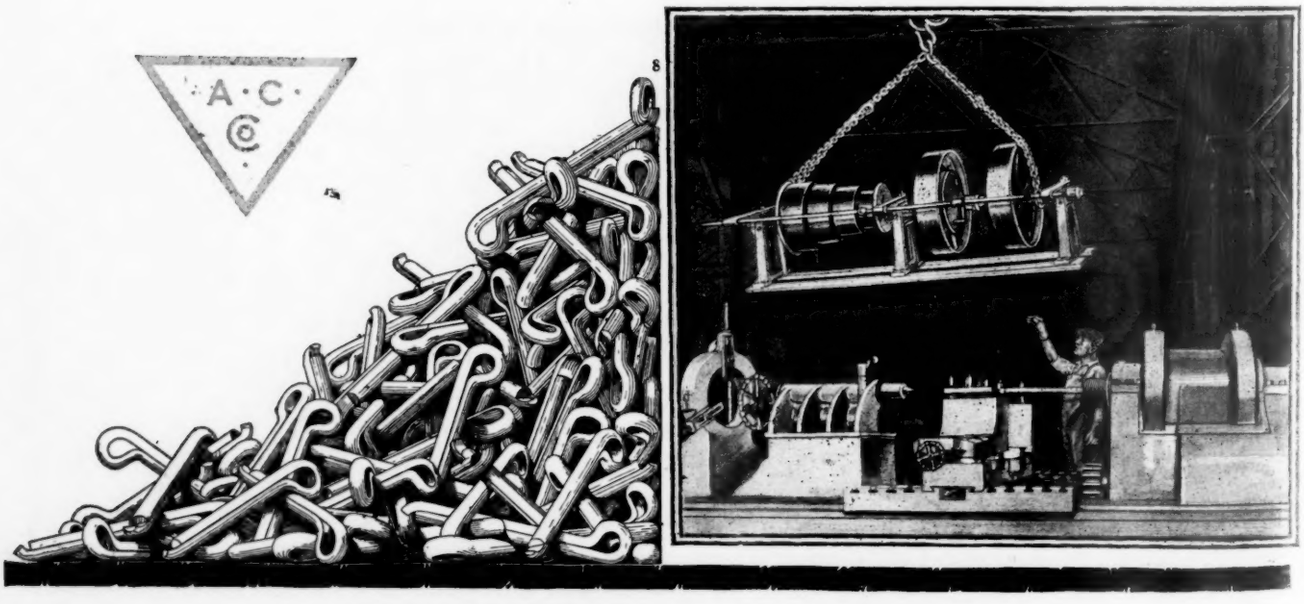

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WE GUARANTEE that of this issue, 14,000 copies were printed; that of these 14,000 copies, 13,480 were mailed to regular paid subscribers to the Railway Age and the Railway Mechanical Engineer; 140 were mailed to advertisers, 280 were provided for counter and news companies' sales, new subscriptions, bound volumes, samples, copies lost in the mail and office use; and 100 copies for distribution at Atlantic City.

THE RAILWAY AGE is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

Several times during the convention the *Daily* has commented on the national shop agreement in relation to the training of college men in railway shops. A large number of railway men have visited the *Daily* to comment upon these editorials. We have been surprised at the very general impression on the part of railroad officers that the Transportation Act makes it necessary to continue the national shop agreement in effect until next September. The Transportation Act does not mention the shop agreement, but it does state that there must be no revision downward of the wages paid to the men before next September. It therefore has absolutely no relation to those provisions of the agreement which do not affect the wages paid to the men.

The Shop Agreement

The failure to keep the development of engine terminals apace with the size and number of locomotives in service has not only slowed up the movement of power through the terminals, but has thrown an added burden on the back shops. There are many roundhouses which are unable to take care of their heavy running repairs because of a lack of drop pit facilities. To produce the maximum output per unit of labor, the back shop program must be interfered with as little as possible, and the best results are obtained where the classified repairs do not have to be interrupted to take care of heavy running repair work. In many cases engine terminals may be made capable of keeping up with their heavy running repairs with a comparatively small expenditure required to provide the much needed drop pit facilities. Since the locomotive inspection rules of the Interstate Commerce Commission have gone into effect drop pit work has materially increased, because of the narrow limits placed on driving box lateral. The ability to take care of all of this work at all times when the shopping of the locomotive is unnecessary and to take care of all engine truck repairs, would relieve the back shop and keep locomotives in service.

Drop Pit Facilities

One of the most interesting features of the closing session was the discussion on the grinding of chilled iron car wheels. In its reports the Committee on Car Wheels has considered mainly the engineering problems of design, though it has necessarily given some attention to wheel mounting practice. There seems to be no reason why the activities of the committee should not be extended to embrace the reclamation of wheels by grinding. This practice has been thoroughly tried on several roads and without exception the results have been satisfactory. It is difficult to explain the dilatoriness of the other roads in adopting it, for it is evident that there is considerable interest in the subject. The grinding process has not been recognized in the past, and perhaps this silence on the part of the committee has been construed by some as a condemnation of the practice. The information incorporated in the proceedings will no doubt be of value to roads that are considering this practice. The matter is so important that the committee would be justified in conducting investigations to determine the limitations of car wheel grinding in order that they might be incorporated in the recommended practices of the association.

Grinding Car Wheels

The conventions held and the exhibit given this year go into history as the most successful railway conventions ever held and the most successful railway equipment and supply exhibit ever given since the earliest meetings of the M. M. and M. C. B. Associations. The *Daily* has frankly expressed its criticism because of the failure of members of the Mechanical Section to discuss certain important problems of their department; especially the labor problem. It is only fair to say, however, that on the whole the reports and discussion this year were unusually interesting and instructive. The reports and discussions in the Purchases and Stores Convention undoubtedly were the best in relation to the subjects with which they dealt ever presented at any convention. The exhibit of equipment and supplies far surpassed all previous exhibits in the amount of space occupied, in the number of exhibitors, and in the number, variety and importance of the devices and materials shown. Too much praise cannot be bestowed upon Chairman Tollerton, of the Mechanical Section; Chairman Pearce, of the Purchases and Stores Section, and President Carr, of the Railway Supply Manufacturers' Association, for the way in which they did their work. All the organizations concerned have had first-class leadership, and it was largely due to this leadership that the conventions and exhibits were made so successful.

The Greatest Conventions and Exhibit

Generally speaking, on clearing all foreign repair bills the net financial result of a scale of prices for labor and material so fixed as to show a profit on foreign car repairs will not be greatly different than it is at present. Objections will probably be most loudly voiced by the roads regularly showing a debit balance in their car repair billing accounts. Any road which consistently neglects foreign equipment will be penalized in the increase in this debit balance, but is this a serious objection? The remedy will not be difficult to apply. The incentive to reduce the penalty and, if possible, change the debit to a credit balance will undoubtedly insure its application. Where foreign cars are now neglected so that when they reach the home rails they are practically in need of rebuilding, they will be kept in good serviceable condition and repairs made currently. In the long run it is improbable that this will increase the actual amount of labor and material used on equipment maintenance. A large amount of the labor and material now required is used in making temporary repairs calculated to get bad order cars off the lines of one carrier to another, or even off one division to the next. Eventually the same repairs must be made which, if made at the outset, would have kept the cars in service for months without appearing on the repair tracks. It is, therefore, reasonable to assume that once the slack is caught up, a stitch-in-time policy will be followed, which will result in more cars in serviceable condition and less delays to traffic from the continual switching out of bad orders.

More Serviceable Cars

It is a matter of regret that the coupler and draft gear committee was unable to present a report on the tests of draft gears conducted at the Rochester plant. The introduction of cars of extremely high capacity has led to additional difficulties in draft gear maintenance by increasing the work that must be absorbed by each gear. There seems to be little agreement as to the best method of improving the situation. A longer draft gear travel is advocated by some. Others object to this on the ground that it will cause an increase in slack and aggravate the trouble instead of lessening it. While with some types of draft gear an increase in the travel might increase the slack, there is no inherent reason why a gear could not be designed to overcome this objection. An increase in the maximum resistance of the gear without increased travel should be feasible on cars with heavy underframes, but the added capacity which could be obtained within the limits of strength of the coupler and underframe members would be small. Some who have given the draft gear problem careful consideration believe that most of the troubles now encountered can be overcome by a campaign of education among the trainmen. Strong arguments can be presented to support this view. Undoubtedly a large share of the damage to cars occurs in switching, and if the speeds in this service could be kept down the capacity of some of the gears now in use should be ample. Most brakemen do not realize that an increase in the speed at impact from four to six miles an hour more than doubles the energy stored in the car. To educate them and keep them educated would require an extensive campaign. It would probably be easier and cheaper to develop a draft gear with a capacity high enough to absorb the shocks developed in coupling heavy cars.

The Draft Gear Question

All of the members who discussed the proposed car repair shop layouts agreed that cranes for lifting cars would be a profitable investment. Further support for this opinion is to be found in the revision of the prices for labor and material. The committee has proposed increasing the price for jacking up one end of a car to $1.50, with similar increases in the charges for changing wheels. This should serve to drive home the loss that is occurring every day because the roads have not made provision for saving expensive labor by the introduction of improved equipment. Probably changing wheels is responsible for more jacking than all other car work combined. Conditions would be greatly improved if this work could be handled by power-driven appliances. For passenger car work a drop pit is most suitable because it is particularly adapted for pedestal type trucks. The gantry crane is proposed for handling freight cars, but at some of the smaller points the expenditure might not be warranted by the savings. In such cases a stationary hoist of sufficient capacity or a power operated jack should prove useful. If a suitable location were available cars could be handled by a winch, thus avoiding the necessity of using a switch engine. But the methods of handling are of secondary importance. The main thing is to eliminate the waste of man power that is costing the railroads huge sums of money in repairing cars.

Jacking Cars by Hand Costs Money

Perfection in engine terminals, and that is what every railroad should be striving for, is very largely a matter of detail. Probably fifty or more important devices directly applicable to engine terminal use were exhibited at the convention. Mechanical men returning home may have at this moment a rather confused recollection of all the devices coming under their observation at the convention. But once more in actual contact with the unpleasant realities of poorly designed, inadequately equipped engine terminals, it is likely that some of the many excellent devices shown on the pier will be vividly recalled. The elaborate smoke removal system recently installed in a Pennsylvania roundhouse may not be equally applicable to a smaller terminal but the neat asbestos fibre smoke jacks should have a wide appeal. Certainly some of the blower fittings on exhibit would be a godsend to the average roundhouse today. While little was shown in the way of heating and lighting arrangements for terminals a good deal could be found in the booths that was more or less intimately related to this. The heating and lighting of roundhouses is generally inadequate and it is to be hoped that most of the mechanical men attending the convention went home with a better conception of the necessity for improving this and many other important details in engine-house construction.

Perfection in Detail

Some of the reports presented before Section III—Mechanical, especially those on comparatively new subjects which came up during last week's sessions, were of an importance far greater than the apparent lack of interest in the discussion would seem to indicate. There are several causes for the lack of discussion over which the officers of the association did not have control. Under the con-

Improve the Discussions—A Suggestion

ditions which have confronted them this year it was impossible to send out the advance copies of the reports in time so that they could be studied before the conventions. Where time limitations make it necessary to present the reports in abstract this is essential if the subjects are to receive intelligent discussion. However, even though these conditions were fulfilled there is frequently a reluctance to start the discussions and valuable time is wasted. This time might be saved if a few of the members known to be particularly interested in the subjects in question, but not members of the committees, were asked in advance of the convention to prepare formal discussions. These members might be selected by the chairmen of the committees or they might be picked by the General Committee from lists submitted by the committee chairmen. Prepared discussions of limited length not only would make use of the time frequently lost in getting the discussions started, but, being confined closely to the subject-matter of the report, would tend to keep the informal discussion more nearly to the point than is usually the case where the entire discussion is informal.

The Storekeeper's Viewpoint

The storekeepers have a commendable faculty of getting down to questions of real cost and actual profit in the conduct of their department. The discussion relating to the subject of reclamation presented at Tuesday's meeting of the Purchases and Stores Section is highly illuminating, not so much for any cost figures actually disclosed as for the keen appreciation of the economics of the proposition expressed in dollars and cents. This section of the American Railroad Association has evidently acquired the ability to discriminate between actual profit and loss and paper profits and losses. While the value of a report detailing the operation of a reclamation plant is appreciated, there is apparently no general disposition on the part of the storekeepers to accept this report as the sole evidence of a profit. Good business judgment, which is to a certain extent intuitive, is perhaps the surest guide in deciding whether the various operations on the railroad are profitable or unprofitable, and while the accumulation of cost data must be encouraged, it is unsafe to rely wholly on these statistics as an index to actual profit or loss, particularly in the operation of a reclamation plant. The storekeepers are merchants, and if they operate a reclamation plant they are manufacturers. Many money-making methods successfully employed by successful merchants and manufacturers can be applied to the service of supply. The storekeepers are primarily business men, and there is much in this week's proceedings of the Purchases and Stores Section that would not only interest mechanical men, but that affords a valuable exposition of the business viewpoint often conspicuous for its absence from the conduct of many railroad departments.

Future of Electric Arc Welding

There is no industry that presents a field for electric arc welding that begins to compare in magnitude with that offered by the railroads. The places where arc welding can be successfully applied are almost without number. The stumbling block that has hampered the more rapid extension of arc welding is the fact that so many welds have failed when subjected to high tensile stresses. As a matter of fact in practically every such instance the failure was not chargeable against the art of electric arc welding, but was due solely to the ignorance of workmen who had the effrontery to style themselves arc welders. There are two things at least that are absolutely fundamental for the successful accomplishment of arc welding; one of these is the use of proper welding materials and the second is a broad knowledge of the work. Because a man's vocal chords are capable of emitting sounds, is no sign that he can speak Chinese; neither is it any indication that because a man can strike an arc he is a welder. And yet, that seems to be about the impression that exists in the minds of many who have not made a study of arc welding. It is no wonder that welds made under such circumstances fail; indeed the wonder would be if they did not. The fact is that the parts are not really welded at all. Notwithstanding the unfortunate stigma that has attached itself to the art of arc welding through the activities of poor workmen, wonderful progress has been made by those who have had the vision, courage and foresight to study deeply into the factors which are so vitally important to successful welding. One road at least is having no difficulty in applying arc welding to any application that seems desirable. The time is coming when the man who poses as an arc welder will have to be all that he claims to be. A long and exacting course of training, as well as adequate supervision of the welders during the course and afterwards are absolute essentials in the production of efficient welders.

Labor Problem Fundamentals

The problems confronting railway executives in handling labor are not identical with those to be solved by manufacturers, and yet fundamental considerations are practically the same in both cases. The same difficulties in securing sufficient help, retaining men now employed and getting each workman to do his share of the work are being experienced by all employers. The way in which these difficulties have been overcome by an eastern machine tool builder is worth more than passing comment because of the breadth of view and the understanding of the economics of the problem. According to this company, there is only one foundation on which satisfactory relations between employer and employee can be based to insure stability of labor and efficiency of production. The principles are: That respect and confidence between employer and employee shall be established and maintained; that a proper and equitable incentive must be provided for both; that there must be established a measure for determining a rate of wage; and that the rate of wage must be definitely related to the energy, skill, experience and knowledge required to perform the work. The way in which these principles are carried out will, of course, vary for each particular case, but there can be no permanent solution of the labor problem until they are fully understood and acted upon. To obtain increased productive capacity is not merely a problem of increasing the number of operators, but rather one involving the retention of operators and increasing their skill and ability. Operators cannot be retained unless they are contented and they cannot do their best work unless a suitable incentive is provided. The organization must be "developed and directed in accordance with certain definite fixed principles of equity and justice, exercised in a broad and intelligent manner."

Shop Committees and Supervision

During the last three years much attention has been given to a number of so-called shop committee schemes, the purpose of which is to provide for the participation of the employees in the settlement of all questions involving working conditions. Esentially those schemes which have been regularly organized by certain large industrial establishments, and the usual shop craft committees of organized labor do not differ greatly so far as the machinery is concerned. Both types can be and have been operated with some degree of success. With any such scheme, however, there is one point which has not been given as much consideration as it merits. This is the effect of the committee plans on the supervision. There is an inevitable tendency where regularly organized committees serve as the medium for intercourse between management and men toward going over the heads of the foremen with many matters which they should logically handle. Where such a practice is encouraged the control of the foremen over the men is seriously affected. The foremen are responsible for output, but the sense of this responsibility is lost because of this lack of control. The result is demoralizing, and if such conditions become established there will be considerable difficulty in developing the quality of supervision that is needed in railroad shops. This difficulty has actually been encountered, and is one of the problems in connection with the present labor situation which must not be lost sight of.

Ground Cutting Tools

Many advantages result from the standardization of lathe, planer, shaper and slotter tools and this standardization has been made possible by grinding the tools from solid stock to previously determined, approved designs. The process does away with rough, inaccurate forging methods in which the steel is often damaged by working either at too low or too high a temperature. The argument that forged tools are better because the steel is worked may hold in the case of poor quality steel, but with good quality high speed steel the possibility of harming it by forgings very much exceeds the possibility of improving it. When ground from the rough stock with considerable metal to be removed, the tools are ground before hardening and with ordinary care there is no harmful effect on the steel. There is a big saving in time, however. In fact, the tool can usually be ground to shape in the length of time that would be required by a blacksmith to heat the metal preliminary to forging. Besides the advantages of decreased cost and better quality, standard tools are more efficient in removing metal. They are all designed and made with the proper profile, rake, clearance and angle of cutting edge to tool shank to remove the metal quickly and with the least consumption of power. The old days have passed when each machinist ground his own tools and there were as many different standards as there were machinists. The more modern practice is to install universal tool grinders in the tool room, and not only make all new tools, but regrind all old ones on these machines. An operator from the machine shop can then replace a broken or worn tool by simply stepping to the tool room window and exchanging it for a good one. No time is lost in grinding; the operator's machine is not idle; and the tool he secures is more efficient than one ground by hand.

Scope of the Service of Supply

Most of the committee reports presented at the first annual meeting of the Purchases and Stores Section of the American Railroad Association have to deal with the technical phases of the service of supply rather than the broad aspects of this service, particularly in its relation to the mechanical and other departments of the railroad. The reports, however, contain many statements or, taken collectively, reveal an attitude that will challenge the attention of mechanical executives and other department heads. The storekeepers represent a highly trained and a highly specialized branch of the railroad service; they are certainly better fitted than any other branch to conduct the service of supply and it may be that they are better equipped to perform duties which at present are assigned to other departments. The assertion, however, that the stores department should assume this or that function is not in itself sufficient; the stores department must demonstrate its superior fitness to undertake the handling of all fuel consumption statistics, and the fact that the association cannot at this time submit any approved method for the compilation of these statistics does not strengthen the argument in favor of the storekeepers taking over a duty that is ordinarily assigned to the operating or the mechanical department. Responsibility for the inspection of new material, including fuel, and of released rail to determine whether this should be classed as fit or scrap should remain with the mechanical and civil engineering staffs until the storekeepers can submit a more convincing argument than will be found in the committee's report in favor of this responsibility being assigned to the stores department.

Locomotive Boiler Circulation

What factor other than size has determined locomotive boiler design in recent years? Have not maximum clearance dimensions been the paramount consideration rather than refinements in design that would tend to make locomotive boilers more effective? In stationary practice circulation is regarded as the keynote to efficiency and capacity. In a water tube boiler the water must travel in a defined path and it does this with great velocity, thus scouring all the internal surfaces and absorbing a greater amount of heat per square foot of heating surface. The limitations imposed on the locomotive boiler are very great in comparison with the stationary boiler and nothing less than a bold stroke will suffice to break away from conventional lines and arrive at something that will put the locomotive boiler on a par with stationary practice so far as circulation is concerned. In attempting this, the mistake has sometimes been made of copying the details of a stationary boiler. The result desired is improved circulation and there are means at hand for securing this without departing from standards of construction that are recognized as practical and safe. Experiments on the Missouri Pacific have shown that a horizontal shield bisecting the boiler shell from the firebox to a point near the front tube sheet will produce a rapid circulation throughout the entire boiler, and autogenous welding has made possible development of the thermic syphon. The results that have been secured with this device may be attributed in a large measure to the greatly improved water circulation obtained.

American Railroad Association—Section III—Mechanical

Interesting Discussion of Car Wheel Grinding Follows Presentation of Committee Report

Chairman Tollerton called the meeting to order at 9.45 A. M.

Report on Couplers and Draft Gears

SINCE THE ADOPTION of the *D* Coupler as a standard of the Association, and rules governing the application of the standard coupler to both new and existing cars, the committee has followed closely the performance of the couplers and kept in touch with the manufacture and gaging of the product.

Slight changes in detail of construction, as well as minor modifications in gages, that tend to improve the manufacture and gaging of the couplers, have been brought to the attention of the committee from time to time by the manufacturers. All such suggestions have been carefully investigated and, if found desirable and in no way affecting the strength or interchangeability of the parts, are approved without submitting to action by the Association.

At the request of the Secretary, your committee furnished information covering couplers for the manual of standards.

The United States Railroad Administration, under the direction of C. B. Young, manager of the inspection and test section, has been conducting very valuable tests on draft gears and attachments. The members of the committee have witnessed some of these tests and have had a representative working with the Administration on these tests. The committee has been advised that a complete report covering all draft gear investigation work done by the Administration will be turned over to them as soon as it is possible to finish tabulation of the data. From the study of this data the committee will be able to prepare a program of such further tests and investigations that are essential, which will be submitted to the General Committee for approval, to the end that final recommendations may be made to the association on this subject.

The report is signed by R. L. Kleine (Chairman), Pennsylvania; F. W. Brazier, New York Central; J. C. Fritts, Lackawanna & Western; G. W. Rink, Central of New Jersey; J. R. Onderdonk, Baltimore & Ohio; J. A. Pilcher, Norfolk & Western; C. B. Young, United States Railroad Administration; L. K. Sillcox, Chicago, Milwaukee & St. Paul, and Prof. L. E. Endsley, University of Pittsburgh.

Discussion

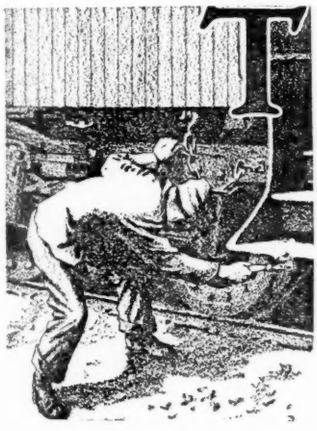
The report was presented by R. L. Kleine (Penn.), chairman of the committee.

C. E. Fuller (U. P.): *I move that the report be accepted and printed, and the committee continued.*

F. W. Brazier (N. Y. C.): I second the motion.

The motion, on being put to a vote, was unanimously carried.

Report of Committee on Car Wheels



THE REPORT OF THIS COMMITTEE submitted to the 1919 convention referred to cast-iron wheels of the so-called arch plate design of 700 and 850 lb. weight respectively, adopted in 1917. The committee now wishes to recommend for adoption as recommended practice wheels of the same general design and of 650 and 750 lb. nominal weight respectively, to take the place of the present 625 and 725 lb. wheels.

These designs are in accordance with recommendations of the Association of Manufacturers of Chilled Car Wheels, and the committee is recommending them for adoption on account of the universally favorable reports on the performance of the 700-lb. arch plate wheel in comparison with the 650-lb. wheel of the former design. Exhibits *A* and *B* show proposed designs for the 650 and 750 lb. wheels. If adopted, these wheels would be marked "A. R. A. 1920," and specifications changed accordingly.

There has again been referred to this committee for recommendation the proposition of increasing the thickness of flanges of cast-iron wheels, and Exhibit *C* is copy of a letter written by E. H. Fritch, secretary, American Railway Engineering Association, to J. E. Fairbanks, general secretary, American Railroad Association, giving the news of the American Railway Engineering Association on this subject.

Exhibit C

The following letter has been received from E. H. Fritch, secretary, American Railway Engineering Association.

"Referring to the contour of chilled car-wheels and throat clearance for frogs, guard rails and crossings, this topic has been under consideration by the Committee on Track of the American Railway Engineering Association, and the following report is made thereon by that committee, and is transmitted to you for your information:

" 'The Track Committee is willing to agree that the flanges can be increased as recommended by the chilled car wheel people, without any serious detriment from a track standpoint, provided:

" '1. That the wheels are in all cases accurately mounted to 3/16 in. additional spread gage.

" '2. That the allowable flange wear before wheels are removed be changed so that wheels will be removed when the flange is worn to within 3/16 in. of the present limit of removal.

" '3. That more care be used in matching wheels on any given axle on account of the reduction in play and the corresponding reduction in compensation from coning.

" '4. That this flange width be confined to flanges of four wheel freight car tracks.

" '5. That this conclusion on the part of the Track Committee be not construed as an invitation to increase the axle load.

" 'With the above provisions, it is believed that it will be unnecessary to make any difference in the width of flangeway of frogs and crossings, or change the present method of track construction.' "

No information has been received that causes the committee

to change its opinion as expressed in the report submitted to the 1916 convention, and, after a full consideration, it is still the opinion that nothing will be gained in the interests of safety or economy by adding material to any portion of the flange of cast-iron car wheels in such location as will affect track clearances, and, furthermore, that such change is unwarranted and inadvisable.

It has been recommended thatt the present method of stenciling the tape size of cast-iron wheels be discontinued and instead a permanent record of this information be provided as follows: Five small lugs 3/8 in. in diameter by 3/4 in. high, to be cast on the inner plate near the hub as shown on sketch, Exhibit *D*. As each wheel is taped the necessary number of lugs are to be broken or cut off, those remaining to indicate the tape size. For example, for a normal wheel tape size 3, two lugs to be broken or cut off, the three remaining indicating a tape 3 wheel. This practice is now being followed by some roads and the information is found to be of value when grinding second-hand wheels. This recommendation is concurred in by the committee.

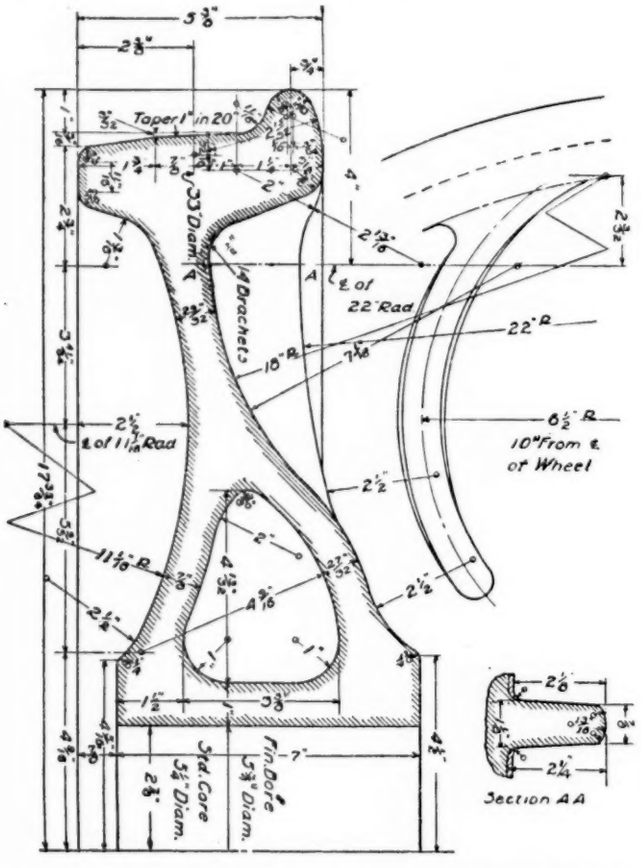


Exhibit A.—Recommended Practice for 33 in. Cast Iron Wheels for Cars of Maximum Gross Weight Not to Exceed 95,000 Pounds

Attention has been called to the fact that when the gaging points of the maximum and minimum flange thickness gage for cast-iron wheels (M. C. B. Sheet 16) wear, it is necessary to condemn the gages; whereas, if the sides of the opening above the gaging points were made parallel and perpendicular it would be possible to regrind the gages and bring them back to standard and it is recommended that these gages be changed accordingly, as shown in Exhibit *E*.

In 1912 the contour of the back of the flange of steel and steel-tired wheels was changed so as to be identical with the flange contour of cast-iron wheels between the base line and the top of the flange, the total width of rim being increased from 5½ to 5 19/32 in., which is the same as the corresponding portion of the cast-iron wheel.

The process of manufacture of wrought-steel wheels is such that the present contour is very difficult to produce, and as far as the committee is able to learn, it is not being furnished by any of the manufacturers, but instead all wrought-steel and steel-tired wheels are being manufactured with the flange in accordance with the design adopted in 1909. Under the circumstances, it is felt that the present contour should be withdrawn from the Standards and the 1909 contour adopted.

In this connection, the committee wishes to state that the design of the wheel check and mounting gage is such that no errors will be introduced on account of this change in the back of the flange.

Complaint has been made of errors in billing for service metal in steel and steel-tired wheels and the matter has been referred to this committee by the Arbitration Committee with the recommendation that a method of measuring service metal and a simpler gage than the present one be outlined. The amount of service metal in a wheel is dependent not only upon the thickness of the tread, but upon the thickness and contour of the flange as well, and only the metal remaining after restoring the standard contour can be considered as service metal.

The gage for measuring steel wheels to restore contour (M. C. B. Sheet C-1) is simple in operation and gives accurate readings, and the committee does not feel that it will be possible to design a simpler gage that will take into account all the dimensions necessary to determine the service metal remaining in wheels. The errors in billing complained of are very evidently due to lack of care in taking measurements and it is also apparent that the gage above referred to is not being generally used.

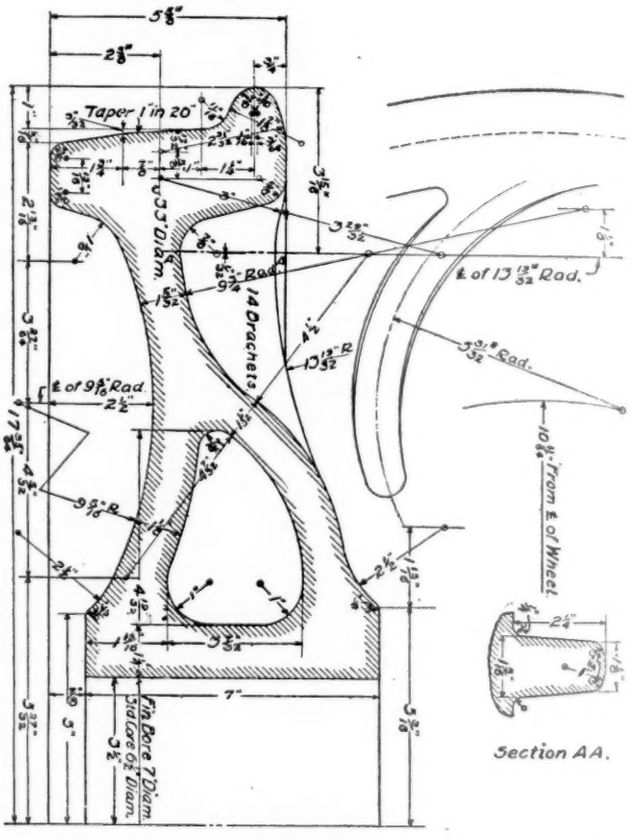


Exhibit B.—Recommended Practice for 33 in. Cast Iron Wheels for Cars of Maximum Gross Weight Not to Exceed 161,000 Lb.

In order to correct the conditions complained of, the committee recommends that the second paragraph, Rule 98, 1919 Rules of Interchange, be modified as follows, the modification being italicised.

The price for new wrought-steel wheels shall be based on the scrap value of $8.00 for metal inside the condemning limit (which is ¼ in. above the limit groove) plus $1.75 for each 1/16 in. of service metal (on radius of tread) in connection with standard full flange contour, as *determined by gage for measuring steel wheels to restore con-*

tour, M C. B. Sheet C-1, also base of limit groove must not be less than 29½ in. in diameter; in no case shall a charge or credit for service metal be made in excess of 1½ in.

It is also recommended that the present recommended practice

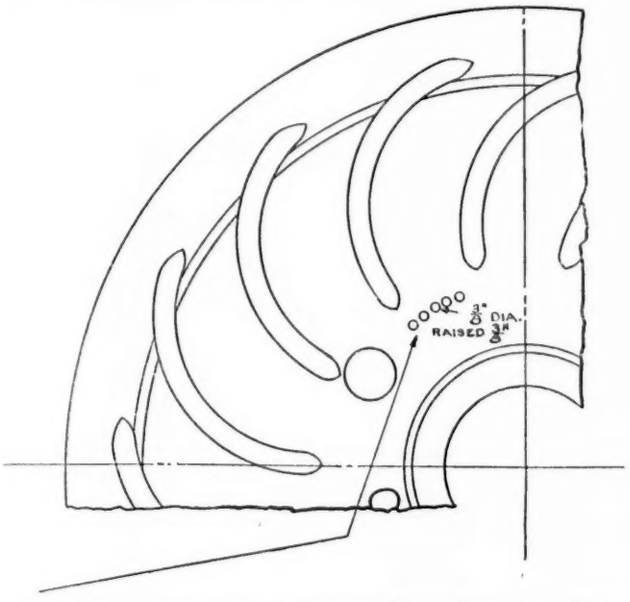


Exhibit D.—Lugs Cast on Hub for Recording Tape Size

gage for measuring steel wheels to restore contour, as shown on M. C. B. Sheet C-1, be advanced from recommended to Standard practice.

The minimum diameter of base of limit of wear of grooves of wrought-steel wheels should be added to sheets as follows, and arrangements have been made accordingly:

M. C. B. Sheet 25 ..... Not less than 29½ in.
M. C. B. Sheet 25A ..... Not less than 32½ in.
M. C. B. Sheet 25B ..... Not less than 34½ in.

Recommendation has been made by one of the companies manufacturing steel wheels that the specifications require wheels to be machined to exact diameter. The committee can see no justification for this added expense, together with the loss of service metal, which is, from the standpoint of wear, the most useful in the wheel. The recommendation, therefore, is not concurred in.

Recommendation has been made by certain of the manufacturers of wrought-steel wheels that the 38-in. wheel be dropped from the standards. Replies to a circular of inquiry indicate that the number of such wheels used is small and that their use is being discontinued as a general practice. It is, however, necessary to use wheels of this diameter in certain cases under motor cars in order to afford proper clearance between the motor housing and the track.

While the use of the 38-in. wheel should be discouraged in the interest of keeping down the number of sizes that have to be carried in stock, the committee feels that as it is a recognized standard of the association it should be allowed to remain among the standards as long as there is need for wheels of this diameter.

It appears to be desirable to revise and amplify the recommended practice of this association for mounting wheels and the following is submitted with the recommendation that it be adopted in place of the present recommended practice for mounting wheels:

Recommended Practice for Mounting of Wheels

1. Standard table of mounting pressure:

MOUNTING PRESSURES IN TONS.

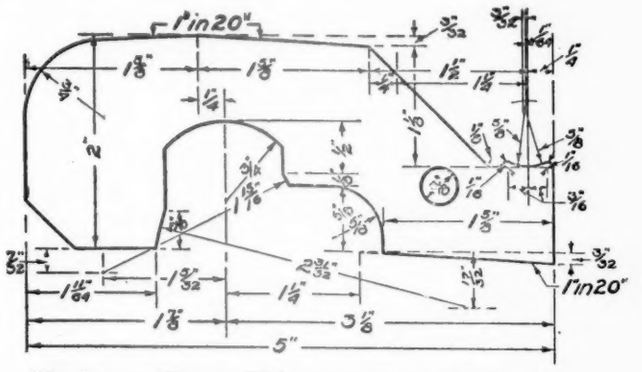
Axle	Wheel seat diameter	Cast iron wheels Minimum	Cast iron wheels Maximum	Steel wheels Minimum	Steel wheels Maximum
A	5⅛ in.	30	45	45	60
B	5¾ in.	35	50	50	70
C	6½ in.	40	60	60	80
D	7 in.	45	65	65	85
E	7⅝ in.	50	70	70	95

2. Wheels having flanges worn so as to take limit gages for remounting cast-iron wheels shown on M. C. B. Sheet 16-A shall not be remounted.

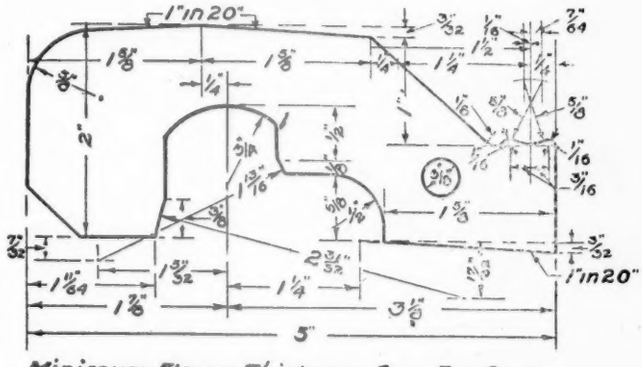
3. The thickness of flanges of wheels fitted on the same axle should be equal and should never vary more than 1/16 in.

4. In mounting of wheels, new or second-hand, the standard wheel mounting and check gage should be used in the following manner:

After one wheel is pressed into position, place the stop "A" or "B" of the check gage against the inside of the flange of the wheel with the thinner flange with the corresponding tread stop "C" or "D" against the tread of the wheel. Press the other wheel on the axle until the opposite tread stop comes in contact with the tread of the corresponding gage point "E" or "F" in contact with the outside of the thicker flange.



Maximum Flange Thickness Gage For Cast Iron Wheels and Maximum Flange Thickness, Height and Throat Radius Gage For Solid Steel and Steel Tired Wheels.



Minimum Flange Thickness Gage For Cast Iron Wheels and Minimum Flange Thickness, Height and Throat Radius Gage For Solid Steel and Steel Tired Wheels.

Exhibit E.—Flange Thickness Gage

5. The wheel seats on all axles must be turned to uniform diameter throughout the entire length of each wheel seat and must be smooth and free from ridges so as to provide even bearing for the wheel fit throughout. The mounting of wheels on axles having the wheel fit tapered is not permissible. The wheels must also have a straight bore with the exception of the chamfering for not more than ⅜ in. at the back hub face which may be allowed to facilitate application to axles.

6. Wheels should be mounted centrally on the axle. All axles should be center punched and some form of gage be used to measure the location of the wheel from this center punch mark. The central mounting of wheels is necessary in order to secure proper running of the wheels and to prevent hot boxes.

7. Wheels should ordinarily be fitted to axles and not axles fitted to the wheels. It is usually unnecessary to turn the wheel seat of second-hand axles unless they are found a tapered fit.

8. In mounting, either new or second-hand wheels, care should be used to see that the wheels are of the same diameter. In the

case of new wheels the wheels should be taped in order to check the tape size marking, and in no case should wheels of different tape sizes be applied to the same axle.

9. The alignment of axle lathe, the trueness of the centers and the jaws on boring mills should be checked frequently in order to insure proper mounting of the wheels.

10. While the wheels are being bored the high spots on the flange should be marked, and in mating the high spots should be put opposite low spots on the mate wheels.

The report is signed by W. C. A. Henry (chairman), Pennsylvania System; W. H. Winterrowd, C. P.; J. A. Pilcher, N. & W.; O. C. Cromwell, B. & O.; J. M. Shackford, D. L. & W.; C. T. Ripley, A. T. & S. F.; E. J. Brennan, C. M. & St. P., and H. Stillman, S. P.

Discussion

W. C. A. Henry, chairman of the committee, presented the report and said: The committee has gone into the subject of the thicker flange, and feels as it did in 1916, that nothing will be gained by making the flange thicker and that this change is inadvisable.

T. H. Goodnow (C. & N. W.) I move that the report be accepted, ordered printed, and that such portions of it as may be necessary be submitted to letter ballot.

The motion was seconded.

F. W. Brazier (N. Y. C.):. I wish that the young men who are in attendance at the meeting would get up and express their opinion on these reports which come before us. We should have more discussion on these reports and it is very desirable that the younger men in the Association should make a start in discussing the various subjects. Referring to the report of this committee, I want to say that you will be surprised if you check up your wheel gages at the presses where the wheels are mounted. I have found, in my experience, that gages will wear as much as ¼ in. The men will keep on using worn gages. They come in contact with the metals and are worn by frequent use. I am giving you this hint—check up your gages when you go home and see if they are not surprised to find how much they have worn.

W. H. Caddington (N. & W.): There is a point brought out in reference to the rolled finished surface of the tread being the most suitable for service. On the N. & W. we have followed the service of steel wheels and it has paid handsomely for the attention given. We have found wheels, in the second and third period of service, that have been turned give far less trouble in tender service on account of wearing than wheels that are rolled. In that respect we anticipate adopting a standard practice of using wheels in tender service that have had the surface metal turned, or wheels in the second or third period of service.

T. H. Goodnow: In connection with the question of the reinforced flange, it was found two or three years ago, that some of the roads using the reinforced flange were not using a mounting gage for that type of flange. I think some of the roads have gone to the reinforced flange. It seems to me, regardless of whether or not the committee approved it, that possibly it would be a good idea for them to show a mounting gage for mounting wheels where the reinforced flange is used for the benefit of the roads that are using them. They are going to get the back side of the flange cut if they mount them with the regular gage.

W. C. A. Henry: The committee received replies from seven different roads that were using flanges thicker than the standard. They are now all alike, however. The committee does not see how they can prepare a standard gage for a non-standard design. In other words there is no specific flange design that is in use by the roads using the thicker flange. Some roads are using wheels which are thicker through the thread or measured at an angle of 45 deg. through the tread and the flange, but those particular designs do not affect track clearances and they are not referred to in the committee's report. We have had reference only to the flange that was thicker at the base line.

B. B. Milner (N. Y. C.): How many lines are using the flanges thickened below the face line, at an angle of 45 deg. through the flange, approximately?

W. C. A. Henry: I cannot tell you. The committee has no information, except that I have heard of a few roads that are doing it. These particular wheels are not thickened in any way so as to affect track clearance, however.

C. T. Ripley (A. T. & S. F.): It is the practice on the road I am connected with to take a light trueing cut on rolled steel wheels after they are mounted. We think there is a distinct advantage in this. We place them on the lathe and then put the tool against them in order to take out any possible eccentricity of mounting as well as of the wheel itself. That doesn't mean we take an appreciable cut off the wheel tread. On some wheels there is practically no cut and we save this skin metal because the skin metal has been proven to give a better wearing surface than metal further in on the wheel. If the roads will swing the wheels this way in the lathe and take a cut off, it would be necessary to pay the enforced high price called for by finishing mills. I think it should be mentioned on the other side of the question that these finishing mills sometimes take out small defects found in the wheel.

There is one other thing that the committee report does not lay particular stress on which I think should be treated, and that is the matter of grinding the slid-flat cast iron wheels. The cast iron wheels now are worth a great deal of money. We have been doing this work for about 10 years, and it has been one of the best saving propositions that was ever adopted on our railroad, and I do not think that any railroad can afford to let it pass. During the period of federal control, we ground a good many wheels for other roads, and so far as we can learn, there was never any dissatisfaction with the results. In fact, many people felt that this ground wheel is better than a new wheel. It is truly round and hasn't as much tendency to slide-flat. In these times of high prices, I think the committee on car wheels could certainly lay more stress on the savings such as can be effected by grinding slid-flat cast iron wheels.

C. E. Fuller (U. P.): I would like to ask the gentleman what method he has of determining the depth of chill on wheels that he is regrinding.

C. T. Ripley: Before starting regrinding we broke up a great many wheels, went through the records of all inspections of drop tests and terminal tests of wheels which are broken up at the plant. We plotted curves showing the chill in all kinds of wheels with different tape sizes. We measured this chill from the original tape size and the tape size at the time of grinding and prepared tables showing exactly the length of the slid-flat spots which can be ground. With the original tape size known and with the tape size at the date of grinding, a definite depth of chill is determined. I personally have gone over a pile of wheels in the shop, and to date have never found a wheel worn through the chill in one of our re-ground wheels, simply due to the fact that we have properly selected the wheels for grinding. All wheels should not be ground, but if the men have such tables, and have the experience, they can easily select the wheels which can be ground.

C. E. Fuller: Do you find any difference in the thickness of chill; that is, thicker on one side than the other?

C. T. Ripley: Very little. There is a slight difference but not much. We play on the safe side in the regrinding so that we never run into them.

C. E. Fuller: I was wondering what that safe side is.

C. T. Ripley: I haven't the tables with me, but the tables leave enough chill in the wheel so that you will not wear more than ¼ in. on the tread of a cast-iron wheel. If you leave ⅜ in. to ½ in. of chilled metal I think you will not have any trouble.

C. E. Fuller: Did I understand you to say that you selected your wheels from different types? Is there any type wheel you do not grind?

C. T. Ripley: No, sir. We grind a shorter slid-flat spot on a high tape wheel.

C. E. Fuller: The subject is a very interesting one, and if there is any positive method of determining the thickness of chill to which you can grind wheels safely, I think the subject is worth a good deal of consideration.

O. C. Cromwell (B. & O.): Mr. Brazier spoke of checking the gages. We have been having a very rapid turnover in labor that takes care of wheels. I believe if the members of this convention would go home and check the wheels they will find something more interesting than they will find in checking the gages. We find the labor is not always educated as to their duties and they think mounting a wheel is an ordinary proposition. If you examine the wheels you will find in many instances that one will have a sharp flange and the other a whole flange. We can't go back to the manufacturer and get

a replacement on that kind of a wheel. The railroads have to pay for them, and that trouble is due to improper wheel mounting. Some of you gentlemen don't believe the actual wheel fits are eccentric. If you will go into a wheel shop and examine the axles that have been removed from some cars you will find that the wheel fits are not round. This condition contributes to sharp flanges. The pressmen that roll the wheel in the press let it lean on one side and start to press the axle in, which results in a cocked axle. It is more important to look after the wheel fits than it is to check gages. I think that this question of providing another gage for a reinforced flange ought not to be considered at all. If we are going to have a standard flange we ought to hold on to it. The committee chairman has emphasized the question of the new marking recommended for the taped sizes of wheels. We find that wheels after they have been in the service for a while, are covered with grease on the outside, and that the tape markings have been eliminated. By putting the permanent marking on the inside of the wheel it is possible to check when two wheels of the same tape size are on the same axle.

W. H. Coddington (N. & W.): May I refer to the subject again of grinding cast-iron wheels? In the investigation of derailments, due to burst cast iron wheels, we almost invariably find that this bursting of the wheel originates in fine transverse tread cracks that have been brought about by the sliding of the wheel at that particular point. We have provided machinery for grinding cast-iron wheels, but considered it a rather treacherous proposition, due to the punishment the wheel has received on account of sliding. I would bring up that point and ask Mr. Ripley what his observations have been in that respect on his road.

C. T. Ripley (A. T. & S. F.): In our experience most of the wheels that burst, burst in the other direction, rather than from the hub. If the wheel bursts from the hub to the bottom, the breakage usually starts from the hub rather than from the ring. We also have wheels that break through the ring, but as a rule that starts in the plate. A piece comes out and breaks through the ring and that break may be found at a point where there has been a brake burn. I never thought that the breaks I have referred to were due to these brake burn checks. We do not regrind the badly brake-burned wheel, but the small check does no harm. I have never had a defective wheel so far as those slid flats places are concerned.

C. E. Fuller (U. P.): I would like to ask Mr. Ripley what has been the average cost of grinding these wheels.

C. T. Ripley: Before the war, the cost of grinding was 53 cents, including all overhead, depreciation, interest charges, in connection with the grinding of the wheel and the labor for handling and turning. The cost now is up around $1. I have made a recent investigation of two types of machines, and as a result I find that the early machines were only about half as efficient as the later machines, due to the fact that it took longer to get the wheels in and out. We have discontinued the earlier type of machine.

C. E. Fuller: You mated the wheels and reground them?

C. T. Ripley: We take them out of the service as they come in.

C. E. Fuller: You have to pull off some wheels and put on other wheels before mating them up for grinding?

C. T. Ripley: Occasionally that occurs, but as a rule you will find the wheels on two sides are very similar; the slid-flats are about the same.

W. C. A. Henry: The question of machining the tread of the steel wheel seems to have been taken exception to. The surface metal on account of the working is denser than the metal nearer the center of the rim. It is very hard to see why we do not get more mileage from the metal near the surface than further in, and I will ask Mr. Ripley whether in machining steel wheels, that is not for the purpose of insuring that they are mounted centrally on the axle?

C. T. Ripley: There is another element, and that is the one of trueing up the wheels, due both to eccentric mounting and eccentricities in the wheel. We have to specify a certain tolerance for steel wheels. When a wheel passes the specifications, allowing an eccentricity of 1-16 in. we take that out and put it in the lathe, making it a true running wheel.

T. H. Goodnow (C. & N. W.): Mr. Cromwell's remarks about the cutting of the flange, bring out a point I want to make. As there are roads using this kind of car wheel, and the manufacturers have decided on what the reinforced flange would be, I think that a gage could be shown, which would show a flange of certain thickness, and thus be a guide for those who had occasion to mount the wheel.

W. C. A. Henry: In answer to that statement, I do not know what the flange is, and I do not know how I can design a gage for it.

P. P. Barthelemy (Gt. Nor.): We have made a number of tests, taking a trueing cut on newly set tires and have found them considerably off. Another point which has not been brought out in the discussion is the turning down of steel wheels. I have noticed that in these hurry-up days a number of roads take a roughing cut, thus heating the surface of the wheels, which comes out very rough, and the result is that the calibrations are not true in each wheel, and after the wheels have run a while and worn off the markings, they have different diameters. As a result, there is considerable sharp flange wear on the small rail. As to marking the calibrations on cast wheels, I have always assumed it was the practice to check the second-hand wheels before mounting and not take any old markings.

J. A. Pilcher (N. & W.): In reference to Section D, item 1, I understand the wheels are in all cases actually mounted with 3-16 in. additional spread. That means that the advantage of coning is not secured under that plan.

The motion to accept the report was carried.

Report of Committee on Car Construction

CHANGES ARE SUGGESTED in existing standards and practice on the following subjects referred to the committee for this year's report.

Pressed Steel Journal Boxes

An opinion was requested whether the application of pressed steel journal boxes in repairs constituted wrong repairs. The sheets showing standard journal boxes for journals 5 in. by 9 in., 5½ in. by 10 in. and 6 in. by 11 in. contain notes permitting the use of cast iron, malleable iron, pressed steel, or cast steel, provided all the essential dimensions are adhered to.

The bottom lugs on these boxes are an essential part of the box, both in strength and location, for all trucks which depend for their integrity on the proper holding power of the bottom tie bars, but these bottom lugs are not an essential part of the box for trucks with cast-steel or other side frames which do not require the bottom tie bar.

RECOMMENDATIONS

Add the following note to each sheet showing standard freight car journal boxes:

When used with side frames of such design that the bottom tie bar is omitted or is not an essential strength member for carrying the load, the bottom box lugs may be omitted. When used in connection with other side frames, the bottom box lugs must be equivalent, both in location and strength, to those shown.

Add the completed notes to all other freight car journal box drawings.

Automobile Side Doors

The 1919 report made reference to a request of the General Motors Corporation that 10-ft. double side doors with movable post should be used on all box cars. This request has been renewed, and the committee has adopted the following resolution,

and recommended sending it to the executive committee of the American Railroad Association:

Resolved, That the committee is opposed to any consideration of the rebuilding of existing cars providing them with wide side doors, as the framing will be inadequate, unless entirely rebuilt, and does not recommend that all box cars should be built with wide doors to facilitate the loading of automobiles, for the reason that the cost of coopering such cars will be approximately twice the cost of coopering a car with six-foot doors. The failures of double doors in service will result in a very considerable increase in the number of cars out of service for defective doors. The first as well as the maintenance cost will be increased.

The cars with wide side doors should be considered as special cars—only to be provided in such numbers as traffic conditions warrant.

It is recommended that the executive committee of the Association endeavor to bring about very close co-operation between railroads and manufacturers, who ship raw materials or parts to automobile manufacturers, to the end that orders for cars for such shipments shall specify that automobile cars are to be furnished to as great an extent as available. This arrangement will automatically return to the automobile manufacturers many automobile cars which are now being sent elsewhere.

Car Doors and Fixtures

The subject of box car doors has been brought very prominently to the attention of your committee, in many different phases, and demands immediate, decisive and constructive action by this Association.

The causes for complaint set forth in a number of communications relating to defective door fastenings are broken door fastenings, door guides fastened with lag screws, or fastened with bolts in such a way that guides could easily be removed.

It is the observation of the committee that car doors equipped with door fastenings, bottom Z-bar and door guides in accordance with, or equivalent to, the designs shown on Sheet 30, are very seldom found defective as to these parts. There are, however, many thousands of cars in service which have no metal protection on the bottom edge of the door, so that the corners of the door decay and may readily be forced over the guides and opened at the back edge without breaking the seals. There are thousands of cars in service with hasps cored so that the metal is barely ⅛ in. thick, and with the door lock, consisting of a small malleable casting, fastened on the face of the wooden door stop with only two bolts and with the door hasp fastener or staple, consisting of a small hook, fastened with only one bolt. It is the usual condition of cars equipped with this small staple either to have the staple torn off or the front edge of the door broken off.

In 1914 the committee revised several of the important details on sheet 30, Standard Box Car, Outside Hung Side Door, and submitted a specification for reinforcing doors on existing box cars, which, however, was not adopted and when again submitted in 1916 was again rejected. The complaints previously referred to in this report are legitimate, and it is our duty to remove the causes for them. If this is to be done, it is necessary that this Association should adopt some form of specification governing the reinforcement of doors on existing cars.

The committee submits, for the third time, the specification for this purpose, which has been amplified to include, among other things, a Z-bar at the bottom of the door.

It is believed that complaints in regard to opening of doors without breaking seals comes from cars having doors without bottom Z-bar protection, so that the doors decay at the corners and can readily be lifted over the bottom guides. That portion of the loss which is made possible by the removal of bottom guides would be eliminated by the use of guides which can not be removed when door is in closed position, as called for by the specification submitted in 1914.

In submitting the new design of hasp a note is added that when the hasp is drop forged, or of steel plate, the ribs may be omitted.

All-steel doors should have locks, hasp and fastenings considerably stronger than are being recommended on Sheet 30, in view of the greater weight and inertia of such doors; but, as the all-steel doors are comparatively few in number, the committee feels that it is preferable to have the present standard designs of the Association cover wooden doors only, including steel framed wooden doors, and let the all-steel doors be covered by special designs.

The hasp provided for the all-steel doors should interchange with the American Railroad Association standard.

Recommendations

The addition of notes in the present specification for complete new doors is recommended as follows:

The adoption of the modifications of Sheet 30, as described in this report.

Door starters should be provided to move the door two inches or more from its fully closed position.

Means shall be provided, where necessary, for forcing the door into its fully closed position.

Lumber used in the construction of doors shall not contain more than five per cent moisture.

Door rollers must be carried on turned or cold-rolled steel pins. Pins must be a driving fit in bracket or housing. Rollers must be drilled not more than 0.01 in. larger than pin, and outside of roller must be turned or ground so that it will be round and concentric with the bore.

If bottom supported door is used, the lap of the Z-bars, both top and bottom, shall be equivalent to bottom Z-bar, as shown on Sheet 30. Rollers must conform to the above specification, and there shall be sufficient rollers provided so that door is always carried on at least two rollers.

That the specification for new car doors, adopted in 1915, and revised as above, should be extended to cover the application of complete new doors and door fixtures to existing cars.

The adoption of the following specification for reinforcing existing car doors is recommended:

Top of door shall be reinforced by a 1½-in. by 1½-in. by $\frac{3}{16}$-in. angle, or its equivalent, extending horizontally the full width of the door and not more than 12 in. from the top.

Bottom of door must be reinforced by 2½-in. by 1¾-in. by $\frac{3}{16}$-in. Z-bar, or its equivalent, applied as shown in Sheet 30.

Depending leg of Z-bar, or other construction which engages bottom guides, must not be less than 1¾ in.

There shall be not less than four bottom door guides on each side of car, located as shown on Sheet 30, and of the same or equivalent design.

If the design of door is such that the removal of the door guide next to the back door post would permit the door to be pulled away from the car, then this door guide shall be of the same design as shown on Sheet 30, or its equivalent, for this particular location.

Door hasp fastener shall be at least 24 in. long, the same as, or equivalent to, the design on Sheet 30, fastened with not less than five, $\frac{3}{8}$ in. carriage bolts, with nuts on inside of door and bolts riveted over. Fastener shall be of such design that hasp can not be removed without removing bolts from fastener.

Door locks shall be secured by not less than two ½-in. carriage bolts through the closed door stop, and one additional ½-in. bolt through the side of car, with all nuts on inside and bolts riveted over nuts.

Closed door stop shall have two or more lips extending at least 1½-in. over the door to support it against bulging outward. Where all wood closed door stops are used, they should be strengthened against splitting, and should have at least two metal reinforcement brackets similar to closed door stop casting on Sheet 30.

Open door stops, if all wood, should extend the full height of the door, and be strengthened against splitting.

Door starters shall be provided to move the door two inches or more from its fully closed position.

Means shall be provided, if necessary, for forcing the door into its fully closed position.

Lumber used in the construction of doors shall not contain more than five per cent moisture.

Lap of door over door post shall not be less than 2½-in.

The proper clearance must be provided so that ⅜-in. bulging of side of car will not interefere with the free movement of the door.

Door rollers must be carried on turned or cold-rolled steel pins. Pins must be a driving fit in bracket or housing. Rollers must be drilled not more than 0.01 in. larger than pin, and outside of roller must be turned or ground so that it will be round and concentric with the bore.

Door must be designed and vertical clearance provided so that under any service conditions there will be no binding of the door on account of vertical interference of door guides or track.

If the bottom supported door is used, the lap of the Z-bars, both top and bottom, shall be equivalent to bottom Z-bars, as shown on Sheet 30.

Rollers must conform to the above specification, and there shall be sufficient rollers provided so that door is always carried on at least two rollers.

Fastening of End Doors

Resolution adopted by the Association of Railroad Chiefs of Police recommends the fastening of small end doors on the inside before loading, and removal of seal fastening from doors that are so fastened.

In 1913, the Master Car Builders' Association adopted as recommended practice, that end doors must be so constructed that, when closed, they lock automatically by means of a lock accessible from the inside of the car, thus avoiding the necessity of taking seal records. Sheet 30 shows a design of inside fastening which is not automatic, and the committee recommends that recommended practice adopted in 1913 should be advanced to standard, and that the design of inside latch shown on Sheet F should be removed, and a note substituted that the fastening should lock the door automatically from the inside of the car.

Revision of Manual

The committee has modified certain details on Sheet 30, and has added others for your consideration, as follows:

Door hasp has been strengthened by the addition of ribs.

and certain unimportant dimensions have been modified, which will greatly increase its strength. The new design is entirely interchangeable with the former design.

The bottom door guide has been considerably strengthened by the addition of ribs, and two designs have been shown, one for use where the guide is riveted directly to steel side sills, and the other, which is extended downward to provide more bearing surface for use when bolted against wooden sheathing. A note has been added that door guide bolts should be applied with nuts on the inside of the sill, and bolts thoroughly riveted over the nuts.

A design of burglar-proof bottom door guide has been added in which the guide is fastened with carriage bolts, with the heads inside, and the nuts applied with a socket wrench. When the door is in place the bottom Z-bar covers up the nuts so that the guide can not be removed. This design has another advantage in having the fastening bolts directly behind the point where the strain comes on the guide so that the tendency to pull guides downward and away from the side of the car will be much less than with designs where the bolts are lower down. (See Fig. 1.)

The construction of the door itself has been changed to eliminate four diagonal braces and add one more horizontal batten, the object being to reduce the cost of constructing the door, and at the same time provide greater stiffness and strength. (See Fig. 2.)

The section at C-D has been modified to show a distance of one inch from the face of the sheathing to the edge of floor at doorway, to permit the use of a spark strip at the back of the door. A detail has been added to show one form of spark strip; the door clearance provided will permit the use of other forms.

The cross section at C-D, also the side elevation of the complete door, have been modified to show the addition of $\frac{5}{32}$ in. steel plates, inside and outside, for the purpose of supporting the bottom Z-bar.

The cross section through closed door post has been modified to reduce the width of the wooden door stop to 3 in. and increase the lap of the door over the door post to 2½ in. to provide better water-proofing.

Prevention of Grain Leaks

Communications received included statistics showing considerable loss, both on account of grain leaks between side sills and loose siding boards, and on account of pockets back of lining, which can not be emptied without cutting the lining.

Where sheathing is nailed to the outside of sills it should be further held in place by angle iron, channel iron, or strap, securely bolted in place to insure sheathing being held tight against side sill, to prevent grain leaks, bolts to have single nuts and be riveted over. The spacing of bolts shall not exceed 12 in. The preferable construction is to use

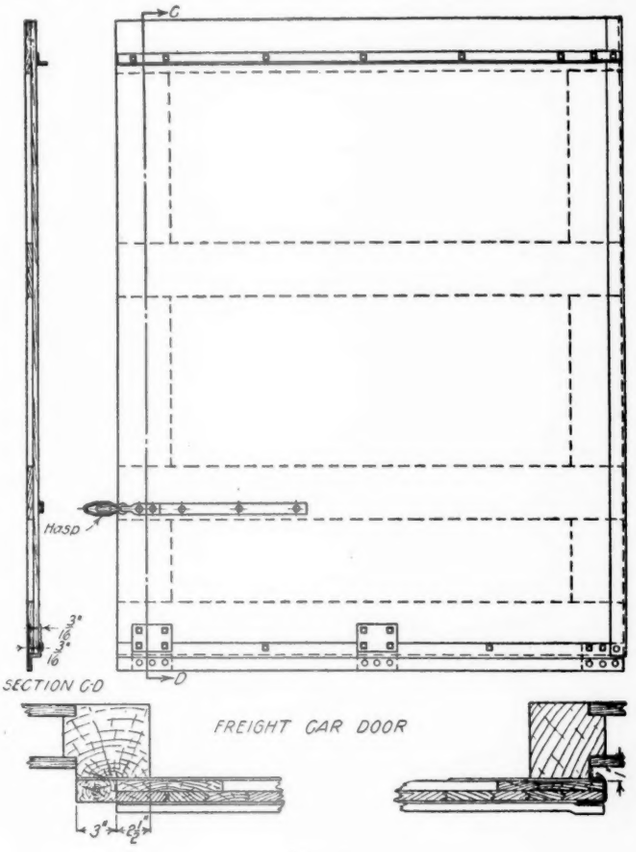


FIG. 2

dropper bar D-24, Jones & Laughlin catalogue, 0.84 lb. per ft. These reinforcing bars shall be located as near top of side sill as construction will permit. After the sheathing has been thus thoroughly secured the space between the ends of floor boards and sheathing shall be carefully filled with a plastic compound which does not become brittle in cold weather. It should then be further protected with triangular grain strips, not less than 3 in. by 3 in.

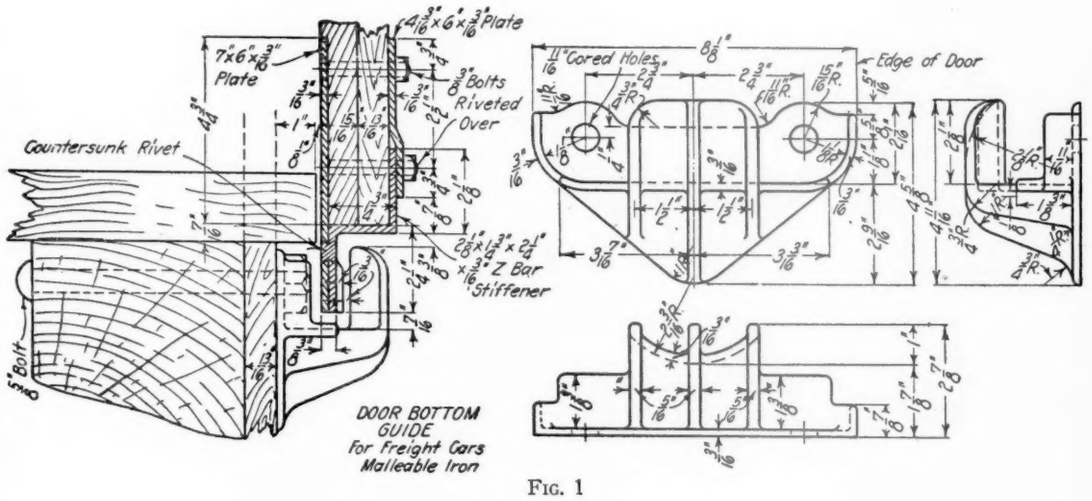


FIG. 1

RECOMMENDATION.

Section 10, of Circular 8, issued by the Assistant Director, Division of Operation, United States Railroad Administration, modified as indicated in the text below, should be made standard:

When wooden lining is used it should have a space between floor and bottom of lining of about 2½ in. Where diagonal braces meet posts, thereby forming pockets, opening shall be provided in the lining of sufficient size to permit free passage of any grain that may possibly lodge behind wooden side linings. The vertical dimension of the opening for this free passageway above the point of pocket, formed by the intersection between post and brace, shall be about 2 in.

Brine Drippings on Rail

Reports presented to the American Railway Engineering Association, on Injury to Signal Equipment, Bridges and Tracks, Due to Brine Drippings from Refrigerator Cars, indicate a necessity for definite action.

RECOMMENDATION

The following rules, which are now recommended practice, should be advanced to standard:

All salt-water drippings should be retained in the ice tanks and drained off only at icing stations.

The total capacity of drain openings should not exceed the capacity of traps, and the capacity of both drains and traps should be sufficient to release all drippings within the time limit of icing the train.

The mechanism adopted for handling drain valves should be simple and positive, and so designed as to insure closing the valves before hatch plugs can be returned to their places.

Salt drippings should be conducted from ice tanks through the regular traps and drain pipes.

Paragraph F, of Interchange Rule 3, has been extended from time to time. It recommended that no further extension be made, and that this rule be enforced beginning October 1 1920.

Minor Adjustments of Standards

On account of additions to standards at intervals of time by different committees, some of the present standards differ slightly in unimportant dimensions. It is, therefore, deemed advisable to establish uniformity.

Breakage of lugs on journal bearings has been reported, and strengthening of them has been suggested.

Journal box lids now standard are claimed to be unsatisfactory, and request was made to improve them .

Present axle capacities increase by steps, which can be made more uniform by increasing the capacity of the axle with 5½-in. by 10-in. journals from 38,000 to 40,000 lb., the present dimensions being such that the allowable stresses will not be exceeded. It was suggested to add another axle with 6½-in. by 12-in. journals, capacity 60,000 lb. and bearing, wedge and box to suit.

To avoid the usual confusion in nomenclature of axles, boxes, trucks and cars, it is thought advisable to classify the axles according to their letter, and to use this as a classification basis for boxes and contained parts also for trucks and cars.

The Committee on Axles, in its splendid report of 1896, did not specifically cover the locus of the points of application of load for calculating the part of the axle between wheel seats. Frames above the journals of the same axle can not spread more than one inch, therefore, the calculations for diameters of axle sections between wheel fits should be based on length between center of journals plus one inch.

BRAKE POWER AND BRAKE BEAMS.

An important question in connection with car design is necessary brake power. The present standard is that the brake power shall be 60 per cent of the light weight of the car based on 50 lb. unit cylinder pressure. Cars in which the ratio of light weight to loaded weight is very low will then have a very low brake power, when cars are fully loaded. Cars in which this ratio is high have a relatively high brake power when cars are fully loaded. It is, therefore, deemed advisable to make a change, and to base the total brake power of the car on 40 per cent of the sum of the light weight plus 25 per cent of the maximum allowable load, and to base this on 50 lb. unit cylinder pressure. This will serve to more nearly equalize the brake power on freight cars with average loads. The possible maximum per cent of brake power for the lightest cars would be 75 per cent of the light weight of the car, based on 50 lb. unit cylinder pressure. The formulæ for brake power will then be as follows:

$$0.40\left\{\frac{W-w}{4}+w\right\}=0.1W+0.3w.$$

but not more than 0.75w.

in which W = Loaded weight of car, maximum,
w = Empty weight of car,
W-w = Maximum allowable load.

As this is based on 50 lb. air pressure per square. in. in the cylinder, and the maximum unit pressure may be from 85 to 88 lb. the maximum brake pressure will be 1.75 (0.1W+4.3W), which, divided by the number of brake beams, will be the required deflection load per beam.

The brake beam set load, which should be somewhat within the elastic limit of the beam, should be approximately 1¾ of this amount.

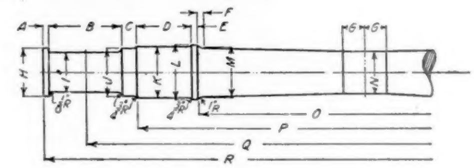
It is recommended that the 6,500-lb. capacity beam be dropped from the standards and that the 12,000-lb. capacity beam be denominated as the No. 1 beam, and that the interchange rules should be amended to conform.

[The committee recommended a number of slight changes in the dimensions of axles and journal bearings, the latter to strengthen the lugs and the use the letters "A" to "F," to designate, respectively, the 3¾-in. by 7-in. to the 6½-in. by 12-in. axles, inclusive. The use of prefix numbers, as "2A," "3A," etc., were recommended for use with the axle designating letter, to indicate the number of axles per truck. Similarly "4A," "6A," etc., is recommended to designate the number and class of axles under the car.—EDITOR.]

Raise the capacity of the "D" axle to 40,000 lb. without changing the dimensions. No existing cars shall be marked up in capacity on account of this increase in allowable axle load until it has been determined that the body and trucks are safe under such a load.

Add axle "F," journal box "F," journal bearing "F," wedge "F" and dust guard "F," as given in tabulations. (See Figs. 3, 4, 5 and 6.)

Make the distance from the center of the dust guard to the top of such that when in place with box, bearing, and wedge of full standard dimensions, the top of the dust guard is 1⅛ in. below the top of the dust guard cavity in the box; the boxes not now provided with an offset at the dust guard opening to hold the wedge to be so provided.



CLASSIFICATION OF AXLE	SIZE OF JOURNAL	DIMENSION																	
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
A	3 3/4"×7"	5/8"	7"	2 1/2"	7 11/16"	13/16"	23/32"	1 1/2"	4 3/4"	3 3/4"	4 3/4"	5 1/8"	5 1/2"	4 7/8"	4 1/4"	3'-10"	5'-3"	6'-3"	6'-11 1/4"
B	4 1/4"×8"	5/8"	8"	2"	7 11/16"	13/16"	23/32"	1 1/2"	5 1/4"	4 1/4"	5 1/4"	5 3/4"	6 1/8"	5 7/16"	4 3/4"	3'-10"	5'-3"	6'-3"	7'-0 1/4"
C	5"×9"	3/4"	9"	2"	7 11/16"	13/16"	23/32"	1 1/2"	6 1/8"	5"	6 1/8"	6 1/2"	6 7/8"	6 3/16"	5 3/8"	3'-10"	5'-3"	6'-4"	7'-2 1/2"
D	5 1/2"×10"	3/4"	10"	2"	7 11/16"	13/16"	23/32"	3"	6 5/8"	5 1/2"	6 5/8"	7"	7 3/8"	6 3/4"	5 7/8"	3'-10"	5'-3"	6'-5"	7'-4 1/2"
E	6"×11"	7/8"	11"	2 1/4"	8 1/4"	1 3/4"	3/4"	3"	7 1/4"	6"	7 1/4"	7 5/8"	8"	7 3/16"	6 7/16"	3'-6 1/2"	5'-2 1/2"	6'-6"	7'-6 3/8"
F	6 1/2"×12"	7/8"	12"	2 1/4"	8 1/4"	1 3/4"	3/4"	3"	7 3/4"	6 1/2"	7 3/4"	8 1/8"	8 1/2"	7 13/16"	6 7/8"	3'-6 1/2"	5'-2 1/2"	6'-7"	7'-8 3/8"

FIG. 3

Increase the width of the dust guard cavity in the 3¾-in. by 7-in. box to 6¾ in., and in the 4¼-in. by 8-in. box to 8 in.

The committee's attention was called to the fact that the standard passenger car pedestals have shown weakness and a large number of them break, indicating a necessity for redesign. It is recommended that Sheets 21 and 22 of the book of standard drawings showing standard passenger car pedestals for 3¾-in by 7-in., 4¼-in by 8-in. and 5-in. by 9-in. journals be eliminated; that pedestals shown in Fig. 7 be substituted for these pedestals for use on trucks with single bottom equalizers.

The present standard journal box lids and bolts should be withdrawn and the following specification for lids substituted:

1. *Scope*—This specification covers all lids for use on A. R. A. standard journal boxes.

2. *Material*—Lids may be made of malleable iron or pressed steel. Material to be not less than 3/16 in. thick.

3. *Functions*—(a) Lid must protect the journal by preventing the entrance into the journal box of dust, sand, fine coal, or other foreign matter.

(b) Lid should prevent oil from working out of the end of the journal box.

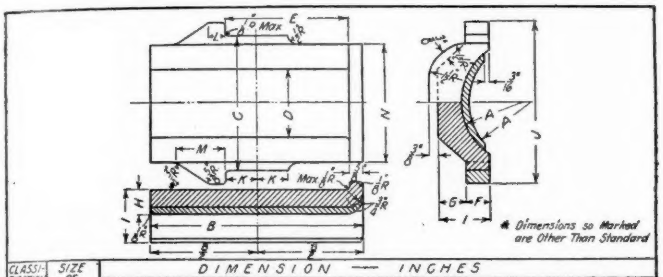
4. *Construction*—(a) Lid to be attached to the journal box by a suitable fastening so arranged that it can be easily opened and closed, but it must retain itself in a fully open position without danger of closing.

(b) When closed, the tension between the lid and fastening must be sufficient to prevent vibration of lid or any parts thereof.

(c) Lids of the hinged type to have the hinge located at the top of the journal box, so arranged that the lid will open outward and upward to an angle of 90 deg. with the lid face of the journal box. Lids of other types should provide an equivalent opening.

(d) A tight contact between the lid and the face of the journal box must be maintained in order to meet the requirements as stated under item No. 3. For journal boxes used on passenger train equipment a machined fit is recommended.
(e) A ledge, flange, or other suitable arrangement, should be provided on the inside of the lid, particularly along the lower part, so that oil thrown against the inside face will drain back into the box.
(f) Springs should be of the coiled type when possible.
(g) The eyes of the lid must be integrally closed.

For calculating the diameters of axles between wheel seats, assume that the loads take effect ½ in. from center

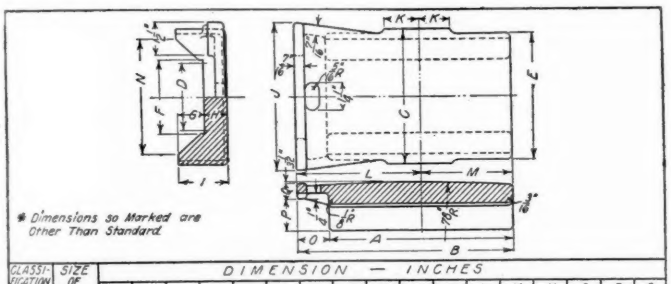


CLASSIFICATION OF BEARING	SIZE OF JOURNAL	DIMENSION — INCHES													
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	3 3/4 × 7	1 29/32	6 3/4	4 1/2	2	*4	7/8	1 1/8	1	2	5 1/2	1 1/4	*1/2	*1 5/8	3 3/4
B	4 1/4 × 8	2 5/32	7 3/4	4 7/8	2 5/16	4 1/2	*27/32	1 9/32	1	*2 1/8	5 7/8	1 1/4	*5/8	*1 3/4	4 3/8
C	5 × 9	2 17/32	8 3/4	5 5/8	3 1/8	5 3/16	*1 1/32	*1 7/32	1 1/8	2 1/4	6 7/8	1 7/16	*11/16	*2 1/16	4 3/4
D	5 1/2 × 10	2 25/32	9 3/4	6 1/8	3 1/8	5 11/16	1 7/16	1 5/16	1 1/8	2 3/8	7 3/8	1 7/16	*3/4	*2 1/4	5 3/8
E	6 × 11	3 1/32	10 3/4	7 1/8	3 1/2	6 5/8	1 1/4	1 1/2	1 1/4	2 3/4	8 3/8	1 7/8	*13/16	*2 7/16	6 1/4
F	6 1/2 × 12	3 9/32	11 3/4	7 5/8	4	7 1/8	1 7/16	1 9/16	1 3/8	3	8 7/8	1 7/8	7/8	2 5/8	6 1/2

Fig. 4

of journal at each end of axle, making the distance between assumed points of load application 1 in. more than the distance between centers of journals. For calculating the diameters of axles outside of wheel seats, assume a lever arm from the section under consideration to the center of journal, plus one-fourth of the standard journal diameter, and allow a unit stress of 10,500 lb. per sq. in. to determine the diameter for minimum road limit.

The Committee on Standard and Recommended Practice suggested revision of center plate drawings to show contour only, and recommend definitely specifying the material of which the center plates may be made. The recommendations of this committee are to eliminate Sheet 20, which is not



CLASSIFICATION OF WEDGE	SIZE OF JOURNAL	DIMENSION — INCHES																
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
A	3 3/4 × 7	*5 3/8	*6 9/16	4 1/2	2 1/16	3 3/4	2 1/4	1	3/4	1 3/4	5	1 1/4	3 7/8	*2 11/16	3 5/8	*1 3/16	1	23/32
B	4 1/4 × 8	6 3/8	7 3/4	4 7/8	2 11/32	4 1/2	2 9/16	1 1/16	7/8	1 15/16	5	1 1/4	4 9/16	3 3/16	4 1/16	1 3/8	1 1/16	27/32
C	5 × 9	7 3/8	8 3/4	5 5/8	3 3/16	5 1/4	3 3/8	1 1/16	1	2 1/16	6 3/4	1 7/16	5 1/16	3 11/16	4 3/4	1 3/8	1 5/16	23/32
D	5 1/2 × 10	8 3/8	9 13/16	6 1/8	3 3/16	5 3/4	3 3/8	1 3/16	1	2 3/16	6 3/4	1 7/16	5 5/8	4 3/16	5 7/32	1 7/16	1 7/16	23/32
E	6 × 11	9 3/8	10 13/16	7 1/8	3 9/16	6 7/8	3 3/4	1 3/8	1 1/8	2 1/2	7 3/4	1 7/8	6 1/8	4 11/16	6 1/8	1 7/16	1 11/16	25/32
F	6 1/2 × 12	10 3/8	11 13/16	7 5/8	4 1/16	7 3/8	4 1/4	1 1/2	1 3/8	2 7/8	8 1/4	1 7/8	6 5/8	5 3/16	6 7/16	1 7/16	1 31/32	7/8

Fig. 5

used in present standard constructions, and advance Sheet "F," which represents present practice, to standard. If the body center plate on Sheet "F" is used in conjunction with the truck center plate on Sheet 20, a 3/16-in. liner should be applied to prevent the body center plate from riding on the outer rim of the truck center plate.

Center plates shall be made either of drop forged or cast steel.

Quality of Steel

Specifications for materials used in car construction are varied from time to time. It has been found that the tendency to lower the requirements for elastic limit and elongation for steel have endangered details which have been based on certain stresses, also the close adherence to requirements for ultimate strength and chemistry has caused rejection of material which was superior to material acceptable under the specifications. It is suggested that the basic requirements which will insure meeting unit stresses allowed in the past be fixed by this committee, that unnecessary restrictions be eliminated, and that the Committee on Specifications and Tests embodying these basic requirements in a specification.

Unit stresses commonly allowed for detail parts of cars made of steel, and which are subject to variable loads and occasional light shock, are 12,500 and 16,000 lb. per sq. in. The minimum elastic limit should be double this amount,

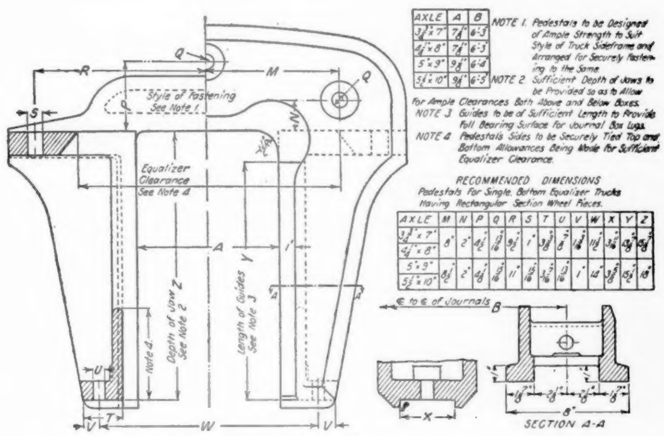


Fig. 6

and the product of elastic limit and elongation should not be less than fifty times the allowable stress. As the test piece usually shows better physical properties than the casting or forging, the requirement for the product of elastic limit and elongation should be increased by 50,000, making it fifty times the allowable stress plus 50,000. The reduction of area is considered secondary in importance. It should be seventy-five times the allowable stress. An addition of 50,000 for variation between the test piece and the casting or forging may be made, but is considered unnecessary. The ultimate strength, content of carbon, manganese and silicon should be left optional, as the other requirements

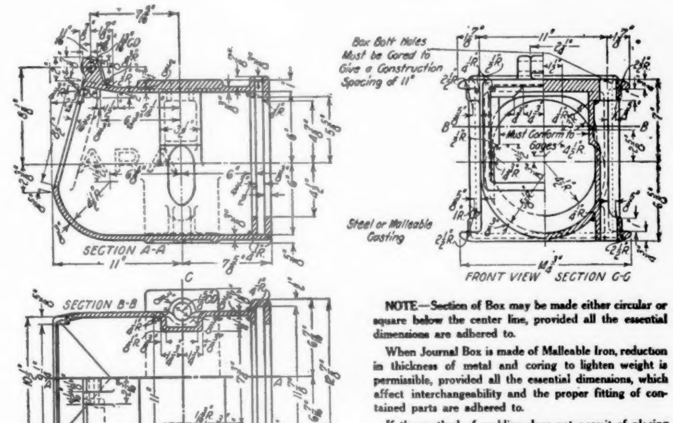


Fig. 7

control these sufficiently and the restrictions used in specifications heretofore have caused rejection of good serviceable material.

The specifications should clearly circumscribe annealing and methods of making tests, the latter to insure uniformly comparative results from different laboratories. The resulting specifications should be made optional for at least one year, to permit manufacturers to adjust themselves thereto.

The resulting specifications should be made optional for

at least one year, to permit manufacturers to adjust themselves thereto.

RECOMMENDATIONS

Provide specifications for all forged and cast steel used in car construction of two grades, based on fundamental requirements given below:

Grade of steel	A	B
Minimum elastic limit (lb.)	26,000	32,000
Product of elastic limit and elongation	700,000	850,000
Product of elastic limit and reduction of area	975,000	1,200,000

The ultimate strength, carbon, manganese and silicon shall be optional.
Sulphur shall not exceed .05 per cent.
Phosphorus shall not exceed .05 per cent.
The elastic limit shall be determined by extensometer.
The elongation shall be measured in a length of 2 in.

Grade "A" steel shall be annealed if the carbon content exceeds .30 per cent, or if the manganese content exceeds .75 per cent. Grade "B" steel shall be annealed if the carbon content exceeds .22 per cent, or if the manganese exceeds .65 pr cent. Pieces of irregular section and of less carbon or manganese content, where shrinkage or other internal strains may be suspected, should also be annealed. Unimportant details may be accepted on surface inspection only.

Fundamentals of Design

In order to prepare the way for the design and adoption of additional standards, it is advisable to confirm or change existing fundamentals and add thereto. The existing fundamentals, both actual and implied, have been discussed in committee. Those recommended for change and those which are added are presented below with reasons for the recommendations. All others given in the list, under the heading of Recommendations, are now either standard or recommended practice and should be affirmed as standard. The committee can then proceed with the consideration of standard detail designs.

HEIGHT FROM RAIL TO CENTER PLATE BEARING SURFACE

Consideration was given to the standard height of 27¾ in. and to the U. S. R. A. height of 25¾ in. The former height would result in a distance from bottom of sills to center line of draft gear of about 4 in., an ideal condition for sills 10 in. deep, and generally satisfactory for sills 12 in. deep. The latter height is ideal for sills 14 in. or 15 in. deep, and moderately satisfactory for sills 12 in. deep. The reason for its use was apparently to eliminate bottom angles in the center sill construction and to somewhat speed up production. However, the elimination of the bottom angles, in connection with the 12-in. channel sills, results in an unbalanced section. A balanced section of the same area will have about 20 per cent greater resisting moment.

With a height of 26¾ in. from rail to center plate bearing face, 12-in. center sills can be arranged as a balanced section and the preferable relation of center line of draft to neutral axis of center sill construction can be maintained, making this the ideal arrangement. A center sill construction with 10-in. channels can also be made generally satisfactory. Little difficulty will be experienced to adjust existing equipment of either 27¾ in. or 25¾ in. height to center plate bearing surface to the proposed height of 26¾ in. The height from the rail to the top of the truck side bearing will necessarily have to be adjusted to suit, to maintain the relative distance of ⅞ in, from center plate bearing face to top of side bearing.

DISTANCE BETWEEN CENTERS OF SIDE BEARINGS

The present rules allow various distances, and it is desirable to concentrate on one distance. The committee has selected a distance of 50. in. between centers of side bearings.

STRENGTH REQUIREMENTS FOR SILLS AND DRAFT ATTACHMENTS

In 1913 this committee adopted a basic figure for strength of draft attachments of 10 sq. in. of steel equivalent to grade "A" material for tension. This strength requirement was somewhat in excess of the strength of the coupler used at that time. A stronger coupler, type "D," has now been adopted, the strength value of which is equivalent to at least 12 sq. in. of steel of the same material.

In order to meet the increased requirements, and compare closely with the increased strength of the coupler, it is desirable to increase the strength requirements for draft gear attachments and center sills by about 20 per cent.

DISTANCE FROM CENTER OF BOLSTER TO FACE OF END SILL CASTING

In order to have uniform construction for draft and draft attachments, it is important that this dimension should be definitely fixed. The committee has selected this distance as 5 ft., which seems to meet all necessary requirements for cars with four-wheel trucks.

DRAFT GEAR TRAVEL, COUPLER HORN CLEARANCE, AND COUPLER SIDE CLEARANCE

Many cars of a length of 40 ft. and more are deficient in side clearance for couplers, and it is imperative that the side clearance be increased. Experience with cars with the draft gear located between center sills indicates that it is undesirable to permit the horn of the coupler to strike the end sill, and that all of the strain should be carried through the rear follower into the center sills at a distance of about one inch below the neutral axis of the center sill construction. Until the Committee on Couplers and Draft Gear has had an opportunity to demonstrate by test that some other travel is preferable, we recommend adopting a draft gear travel with draft gear in place on the car of 2¾ in. The coupler horn clearance should be ¼ in. more, or 3 in. The total coupler side clearance should be increased from 2½ in. to 3 in.

A minimum draft gear capacity of 150,000 lb. is recommended.

RECOMMENDATIONS

The values given in the tabulation below should be approved as standard fundamentals for future design:

1.	Height from rail to center of brake shoe face	13 in.
2.	Height from rail to brake beam hanger fulcrum	24⅞ in.
3.	Height from rail to bottom of truck springs	10⅜ in.
4.	Height from rail to top of springs (empty car)	18¾ in.
5.	Height from rail to center plate wearing surface	26¾ in.
6.	Height from rail to top of truck side bearing	27⅝ in.
7.	Distance from center to center of side bearing	50 in.
8.	Average clearance per side bearing per truck:	
	Minimum	⅛ in.
	Maximum	⅜ in.
9.	Height from rail to floor of box car (minimum)	42 in.
10.	Height from rail to floor of refrigerator car (minimum)	48 in.
11.	Distance between center sills	12⅞ in.
12.	Area of center sill construction between rear followers (minimum)	30 sq. in.
13.	Distance from center of truck to end sill face for cars with 4-wheel trucks	5 ft. 0 in.
14.	Draft gear travel (on car)	2¾ in.
15.	Coupler horn clearance	3 in.
16.	Minimum draft gear capacity	150,000 lb.
17.	Coupler shank side clearance, total	3 in.
18.	Draft gear follower thickness	2¼ in.
19.	Ratio of unit stress to end load (maximum) for center sills	.05
20.	Ratio of unit stress to end load (maximum) for draft attachments	.125
21.	For draft attachments the area of steel in square inches equivalent to the minimum required strength values is:	
21.	Tension or compression (square inches, Grade "A" steel)	12
22.	For shear (sq. in.)	15
23.	For bearing (sq. in.)	7½
	Inside Dimensions of Box Cars:	
24.	Length	40 ft. 6 in.
25.	Width	8 ft. 6 in.
26.	Height	8 ft. 6 in.

27. Hardwood, when used, must have strength values four times those given for steel.

Minor Car Construction Matters

REINFORCING EXISTING BOX CAR ENDS

Various inquiries on this subject indicate the necessity of adopting fixed rules for repairs to existing box car ends. It is recommended that:

1. When ends of cars are broken they should be replaced with ends specified for new cars.

2. The rules for box car ends should be modified by eliminating paragraphs 5 and 6 permitting hard wood or yellow pine posts and braces, thereby making the use of steel posts and braces obligatory.

The revised rules are as follows:

BOX CAR END, DESIGN AND STRENGTH

New cars should have corrugated steel ends, or steel plate ends ¼ in. thick, reinforced between corner posts with the equivalent of either two

vertical steel braces with a total section modulus of not less than 9; or one vertical and two diagonal steel braces with a total section modulus of not less than 10; or three horizontal steel braces with a total section modulus of not less than 10.

New cars may have the following alternative arrangement: Three or more steel braces, two of which run diagonally, with a total section modulus of not less than 12½, and wood lining 1¾ in. thick.

To concentrate strength at a point near floor line on vertical center line of car, diagonal braces should extend from the center sills to the side plates, and not from the bottom corner to the ridge.

The attachments for the braces and the members to which they are attached must be sufficiently strong to realize the full strength of the braces.

Lining at car ends should be supported at intervals not greater than 30 times the thickness.

Two 4-in. by 3-in. Z-bars, 12.4 lb. per ft. have a total section modulus of 9.34.

Two 5-in. I-beams, 9.75 lb. per ft. have a total section modulus of 9.6.

Three 4-in. I-beams, 9.5 lb. per ft. have a total section modulus of 10.2

Three 3-in. Z-bars, 14.2 lb. per ft. have a total section modulus of 10.3.

The corrugated ends referred to may be made of one or more pieces. If made of one piece it should be not less than ¼ in. thick. If made of more than one piece the lower third must be not less than ¼ in. thick, and the remainder should be not less than $\frac{7}{16}$ in. thick.

Hopper and Gondola Car Cross Ties

Request was made for specification of the proper number of cross ties to be used in hopper gondola coal cars.

It is recommended that the distance between cross ties or braces in hopper or high-side gondola cars shall be less than twenty times the width of the top chord of the car side.

Consideration should be given to providing necessary space for use of clam shell buckets in loading or unloading. If the dimensions for distance between cross ties is less than the space required for operating clam shell buckets, the ties shall be alternated with braces extending from the center ridge or floor to a location corresponding with the tie anchorage.

Thickness of Splice Plates for Center Sills When Web of Sills is More Than One-Half Inch Thick

Attention was directed to the use of center sills on some tank cars with webs ⅞ in. thick, and that the rules for splicing of steel center sills would require butt plates of the same thickness, which is inconsistent, and would interfere with proper riveting.

It is recommended that paragraph 2, of the rules for splicing steel center sills be modified as follows:

The splice for center sills, except as otherwise herein stated, to be located not less than 7 in. from either side of the body bolster, consisting of butt joints. The butt joints to be reinforced by plates on both sides to be not less than twice the length of the protruding end, but not exceeding 24 in. and not less than same thickness of web plate, *but not more than ½ in. thick*, with the one on the flange side of channel to include flanges, while the outside plate should only cover the web. The rivets to be spaced as shown on Figs. "A" and "B," Sheet 28.

The report was signed by W. F. Kiesel, Jr. (Chairman), Mechanical Engineer; A. R. Ayers, New York, Chicago & St. Louis; C. E. Fuller, Union Pacific; J. C. Fritts, Delaware, Lackawanna & Western; C. L. Meister, Atlantic Coast Line; J. Coleman, Grand Trunk; W. J. Robider, Canadian Pacific; J. McMullen, Erie; T. H. Goodnow, Chicago & North Western; C. C. Higgins, St. Louis-San Francisco; Jno. Purcell, Atchison, Topeka & Santa Fe; W. H. Fetner, Central of Georgia; W. O. Moody, Illinois Central; J. A. Pilcher, Norfolk & Western, and H. L. Ingersoll, New York Central.

Discussion

W. F. Kiesel, Jr. (Penn.), chairman of the committee, presented the report and said: We have submitted our ideas in regard to what the results of the marking of the steel should be so that the Car Construction Committee will know the stresses to allow. The steel companies can make this steel and we believe that they could readily work to such specifications, but this question will have to be adjusted with the Specification Committee. The distance between the center of side bearings has been established at 50 in. The former rule was between one dimension and another dimension. Standardization is the only thing if design of cars are to be made. Therefore, we think we can all agree on the intermediate dimensions, such as 50 in., so that all future designs will be standard. The fundamentals which we have proposed should be carefully studied and voted on.

C. F. Giles (L. & N.): *I move that the report be received and printed in the proceedings, and such parts of it as are necessary referred to letter ballot.*

The motion was carried.

More Discussion on Brake Beam Report

B. B. Milner (N. Y. C.): Originally, brake beams were numbered 1, 2, 3, 4, etc. for 6,500 lb., 12,000 lb., 18,000 lb. and so on. In 1918 the capacity of the No. 2 beam was increased to 15,000 lb. We believe you will approve the idea of having represented in your standards both the 12,000-lb. and the 15,000-lb. beams. Therefore, it is necessary to include some form of designation for the additional beams.

There are three or four schemes before us. The Brake Beam Committee considered first reporting the proposition of having the 12,000-lb. beam under the No. 2 designation and introducing No. 2½ for the 15,000-lb. beam. This seemed objectionable from a casting standpoint, as it is a little difficult to show a 2½ designation on the strut castings. The committee thought it would be better to call the additional beam 2x. Further thought on the matter suggests that 2+ would be a designation which would mean something to the car repair men who have these beams to handle.

A further proposition was that we eliminate from the standards entirely the 6,500-lb. brake beam, and give the 12,000-lb. brake beam the No. 1 designation, the 15,000-lb. beam the No. 2 designation, and the remaining beams to remain unchanged. Another proposition is to maintain No. 1 for the 6,500-lb., No. 2 for the 12,000-lb., and No. 3 for the 15,000-lb. brake beams, and change the numbers on all of the higher capacity beams.

The proposition to call the additional beam 2+ is the preferred method, and the committee would like to have passed to letter ballot the question of whether that designation is to be used or not.

A motion that the matter be referred to letter ballot was carried.

Report of Committee on Safety Appliances

No ADVANCE REPORT was printed by this committee as it was not possible to get the information together in time to prepare such report.

On May 24, 1920, a hearing was held by the Interstate Commerce Commission relative to an extension of time within which to comply with the commission's order of August 29, 1919, concerning the application of safety appliances. Extension was not granted by the commission, however, arrangements has been made to have the Commission on Car Service issue instructions to require the loading of cars not fully equipped with United States Safety Appliances or United States Safety Appliances, Standard, to the car owner by any route.

In view of this action, Circular S III-149 was issued May 29, 1920, effective June 1, 1920, modifying Section K of Rule 3 to read as follows:

"After March 1, 1920, no car will be accepted in interchange unless properly equipped with United States Safety Appliances or United States Safety Appliances, Standard, *except cars moving home on car service orders for equipping with safety appliances. Cars will not be accepted from owner at any time unless equipped with United States Safety Appliances or United States Safety Appliances, Standard.*"

Every effort should be made to complete the equipment of such cars with Safety Appliances at the earliest possible date.

[A statement showing the number of freight cars to be equipped with safety appliances of February 1, 1920, will be included with the report in the official proceedings of the Section.—EDITOR.]

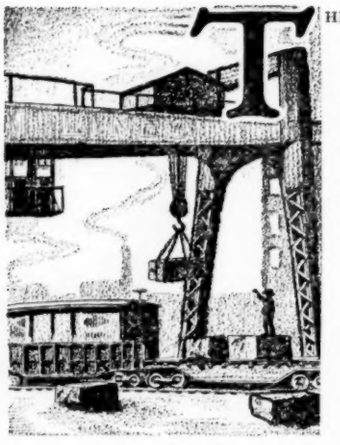
The report was signed by C. E. Chambers (Chairman), Central of New Jersey; C. E. Fuller, Union Pacific; H. T. Bentley, Chicago & North Western; W. J. Tollerton, Chicago, Rock Island and Pacific; J. T. Wallis, Pennsylvania, and C. F. Giles, Louisville & Nashville.

Discussion

The report of the committee was read by the secretary.

A motion that the report be accepted was duly seconded and carried.

Report of Committee on Loading Rules



THE COMMITTEE HAS RECEIVED a number of recommendations and suggestions from shippers of various commodities relative to new rules and changes in existing rules in the present code. These suggestions have been investigated, and where changes are deemed necessary the rules have been revised or new rules provided.

Attention is called to a proposed plan, outlined herein, covering a rearrangement of the loading rules book. The purpose of this rearrangement is to eliminate duplication of various rules and tables and to group the rules in such manner that the whole book can be covered in six pamphlets, for the convenience of shippers who desire the rules in one pamphlet form covering their particular commodity.

Following is a list of the new rules and changes in existing rules presented for approval:

Supplement No. 2, page 2—Fig. 3-A.—Substitute composite spacing-block shown for composite spacing-blocks now shown on Fig. 3-A.

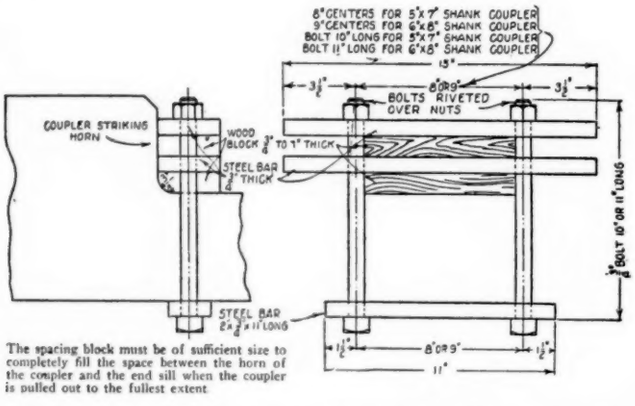


Fig. 3-A—Composite Spacing Block for Twin or Triple Loaders—Alternative Arrangement

Supplement No. 2, page 2.—Change word "blocks" to "block" in note referring to Fig. 3-A. *Explanation.*—The design of composite spacing-block shown above is substituted for the two designs shown on Fig. 3-A, Supplement No. 2, on account of improvement in design.

Maximum Weight Tables, pages 14, 26, 58 and 102.—Change tables as follows: First column, change heading to read, "length of car over end sills." Fifth column, headed "(capacity of car, 100,000 Lb.)," substitute the limits now appearing in the sixth column, headed "(capacity of car, 110,000 Lb.)," for those appearing in the fifth column. Omit sixth column from table. *Explanation.*—Heading changed and sixth column omitted to clarify rule. Limits for 100,000 lb. capacity cars increased to obtain maximum allowable loading.

Paragraph 7, page 4.—Change 46 in. to 50 in. in third line of paragraph. *Explanation.*—Limit on height of car sides extended to fifty (50) in. to permit use of additional cars.

Paragraph 513, page 3, Supplement No. 2,—Change third sentence of third paragraph to read as follows: "Total weight of plates loaded diagonally must not exceed 75 per cent of the load weight, as per Paragraph 509." *Explanation.*—To make Paragraph 513 conform with table in Rule 509.

Paragraph 513, page 4, Supplement No. 2.—Beginning with word "plates" in thirteenth line, revise the paragraph to read as follows: "Plates may be loaded diagonally with one side resting on top of car side. On cars with fish-belly type side sills the total weight of plates loaded in this manner must not exceed 50 per cent of the car capacity when load is distributed uniformly over full length of car. Other cars of steel or steel underframe construction may be loaded in this manner up to 25 per cent of capacity. In all cases, supporting posts 4 in. by 4 in., placed in inside stake pockets or bolted to car sides, shall be used for each 9000 lb. of lading, with a minimum of two posts per load." *Explanation.*—Paragraph revised to more clearly define manner of loading plates diagonally with one side resting on top of car side, and to establish limits for this type of load.

Paragraph 513, page 3, Supplement No. 2,—Substitute following table for table contained in this paragraph:

Maximum load allowed per post	Size of posts	Length of posts	Diagonal (post) tie rods Number	Diagonal (post) tie rods Diam.	Bolts securing each post to side boards Number	Bolts securing each post to side boards Diam.
17,000 lbs.	6 by 8 in.	5 ft. or less	1 per post	⅞ in.	2	⅞ in.
13,000 lbs.	6 by 8 in.	over 5 ft.	1 per post	⅞ in.	2	⅞ in.
12,000 lbs.	6 by 6 in.	5 ft. or less	1 per post	¾ in.	2	¾ in.
9,000 lbs.	6 by 6 in.	over 5 ft.	1 per post	¾ in.	2	¾ in.

Explanation.—Table revised to permit increased loading within safe limits.

Paragraph 513, page 4, Supplement No. 2.—Under heading "round plates, flat or flanged," revise text to read as follows: "round plates, flat or flanged, may be loaded as per Figs. 38-B, 38-C or 38-F. This manner of loading is the same as for ordinary plates, except that when loading according to Figs. 38-B and 38-C a 4 in. by 8 in. horizontal bearing piece is bolted at top of posts to form a rest for the plates. Longitudinal shifting to be prevented by tie rods running across the car and bearing against edge of plates or by stop blocks 6 in. by 8 in. bolted to the floor of the car or secured by cleats spiked to sides and floor of car." *Explanation.*—Paragraph revised to include method of

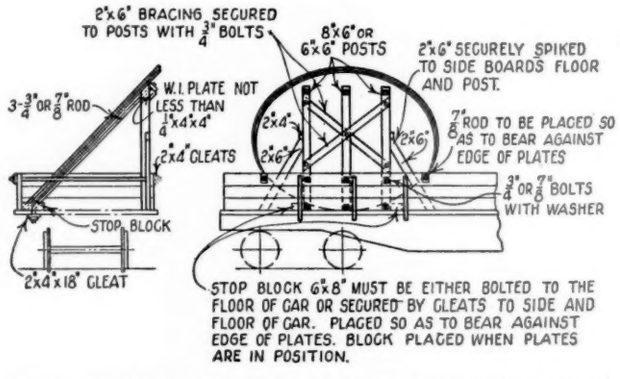


Fig. 38-F—Manner of Securing Round Flat Plates Loaded Diagonally on Gondola Cars Having Wooden Side Boards

loading shown on Fig. 38-F as an alternative and to include tie rods across the car as an additional means to prevent longitudinal shifting.

Figs. 38 and 38-A, page 88; Figs. 38-B and 38-C, page 5, Supplement No. 2.—Change these figures to show horizontal tie rods and stop blocks to prevent longitudinal shifting and add the following notes: "⅞ in. rod to be placed so as to bear against edge of plates," and "stop blocks 6 in. by 8 in. must be either bolted to the floor of car or secured by cleats spiked to sides and floor of car." *Explanation.*—To conform with revised Rule 513, Supplement No. 2.

Paragraph 514, page 4, Supplement No. 2.—Revise paragraph to read as follows: "Gondola cars loaded with plates or other material on floor of car may have plates that are too wide for the car loaded on top of car sides when height of sides does not exceed three (3) ft. (See Fig. 38-D or 38-E.) Such superimposed plates must be supported by posts 4 in. by 6 in., one set of posts for each 6 ft. length of lading, with a minimum of 3 sets of posts

for each tier of plates. Side motion to be prevented by not less than 2 clamps constructed as shown on Figs. 38-D or 38-E. Longitudinal motion to be prevented by struts 2 in. by 8 in. against end of lading and spiked or bolted to sides of car. Total weight of plates loaded in this manner must not exceed 75 per cent of the load weight, as per paragraph 509." *Explanation.*—Rule revised to include an alternate method of loading as shown on Fig. 38-E. Maximum weight allowance also provided for.

Paragraph 527, page 7, Supplement No. 2.—Revise to read as

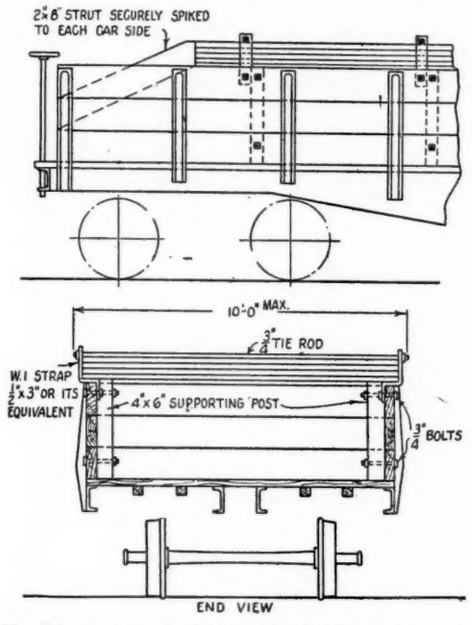


Fig. 38-E—Manner of Securing Flat Plates Loaded on Top of Car Sides

follows: "When one or both bearing pieces are placed on the car floor they must be located over the car body-bolster or between car body-bolsters, and must never be placed between car body-bolster and end of car unless special provision is made therefor in detail instructions. When one or both bearing-pieces are placed on top of car sides they may be located within 12 in. either side of the center line of car body-bolsters."

Paragraph 530, pages 103 and 104.—Insert the following, clause for clause, beginning with "The" in the third line: "The bearing-piece to be placed on the floor above car body-bolster or between car body-bolsters and extending the width of car, and must be secured from shifting by cleats nailed or bolted to the floor."

Paragraph 546, page 112.—Change second sentence to read as follows: "When there is but one bearing-piece per car, either on floor or on top of car sides, it must be placed at least 12 in. from center of car body-bolster toward center of car." *Explanation.*—Paragraphs 527, 530 and 546 revised to clarify rules with regard to location of bearing-pieces.

Paragraph 535, page 104.—Add Figs. 47 and 48 in first line of rule. *Explanation.*—To cover loads on sides of steel cars.

Paragraph 534, page 104.—Beginning with word "this" in fifth line of second paragraph, change the paragraph to read as follows: "This bearing-piece may rest on top of car sides within 1 ft. of either side of center line of car body-bolster on cars having wooden sides not more than 5 in. high and not less than 3 in. thick, or on top of steel sides especially reinforced to carry such top loads, or bearing-piece may rest on the car floor over the car body-bolster or between car body-bolsters. Bearing-piece on top of car sides must have ends notched for the side boards and be securely braced to prevent both lateral and longitudinal motion, as well as bending and rolling. Figs. 48, 49 and 50 show substantially how bearing-pieces are to be supported and held in place. Steel gondola cars, suitable for carrying loads on top of car sides as shown on Fig. 48, should have 15/16 in. holes spaced 12 in., center to center, drilled in top side angles on each side of car and located 6 in. each side of center line of car body-bolster. Lading must not be placed on top of wooden cars having sides less than 3 in. thick or steel cars having sides not of sufficient strength to carry the lading." *Explanation.*—Rule changed to cover flexible material loaded on car floor and to include limits for height and thickness of car sides. Also changed to direct attention of railroads to the necessity of providing bolt holes in side angles of steel cars to secure bearing pieces.

Paragraph 547, page 112.—In second line of paragraph, change 46 in. to 50 in. *Explanation.*—Limit on height of car sides extended to 50 in. to permit use of additional cars.

Paragraph 548 C, page 117.—Add the following to paragraph: "For loads on top of sides of gondola cars, the distance from top of rail to center of load, measured at bearing-pieces, must not exceed 9 ft. 3 in.." *Explanation.*—Paragraph added to make rule conform with Paragraph 15-D of the general rules.

Paragraph 55-G, page 2, Supplement No. 1.—Revise to read as follows: "Loads are limited to 6 ft. in height. For allowable weight of load see Paragraphs 548-A, 548-B and 548-C." *Explanation.*—Paragraph revised to make weight allowance conform with existing rules.

Figs. 49 and 50.—Change diagonal braces spiked to the side of the car from 2 in. by 6 in. to 2 in. by 8 in. *Explanation.*—To provide for safety of load, as it has been found that present size of braces is inadequate.

Paragraph 558, page 7, Supplement No. 2.—Change last sentence of paragraph to read as follows: "The bearing-pieces must be secured to the car in the manner described in paragraphs 547, page 112, and 555, page 2, Supplement No. 1, and the material must be clamped together in the manner described in paragraph 559 to prevent it from shifting. *Explanation.*—Rule changed to show proper references for bearing-pieces and clamping-pieces.

Paragraph 559, page 8, Supplement No. 2.—Change paragraph to read as follows: "When the lading requires two bearing-pieces and two or more sliding-pieces, the bearing-pieces are to be provided with clamps consisting of a hardwood top clamping-piece 6 in. by 8 in. in section and 2 vertical rods 1¼ in. in diameter placed close to load and passing through clamping-piece and bearing-piece, for loads placed on top of car sides, and through clamping-piece, bearing-piece and floor of car for loads resting on car floor. Clamps to be applied in the manner shown on Figs. 42 or 54. When the load, measured from top of bearing-piece to top of load, exceeds 24 in. in height the bracing for clamping piece on top of load must be same as shown in Fig. 46." *Explanation.*—Paragraph revised to more clearly define manner of clamping at bearing-pieces.

Paragraph 562, page 127.—Change first sentence of paragraph to read as follows: "Binders consisting of two horizontal hardwood pieces of timber 4 in. by 6 in. in section (with ½ in. bolts and suitable washer under head and nut in each end to prevent splitting), drawn together by means of two 1¼ in. rods placed close to load, shall be applied midway between bearing-pieces." *Explanation.*—Paragraph revised to cover application of binders.

Fig. 60, page 126; Fig. 61, page 129.—Insert word "plate" after word "flexible" in the heading of these figures. Show one binder located midway between bolsters on each figure in place of two binders for the load, as now shown. *Explanation.*—The heading of figure is changed to more clearly define the character of lading. The requirement for binders has been modified with a view of economy within the limit of safety.

Paragraph 806, page 156.—Add the following sentence at the end of this paragraph: "Boards, when used to tie stakes together longitudinally with side of car, must be secured to the inside of the stakes and must not, under any circumstances, be nailed to the outside of the stakes." *Explanation.*—To provide safety where such boards are used.

Paragraph 814, page 158.—Change third sentence, beginning with the word "opposite" on eighth line, to read: "Opposite stakes should then be secured by wire as close to top of car sides as practicable, but not over 18 in. above top of same, and further loading of pipe should be placed on this wire." *Explanation.*—Rule revised to permit wiring for stakes to be located within 18 in. of top of car sides to conform with notes on Figs. 74, 75 and 76.

"Paragraph 814, page 158.—In the eleventh line of this paragraph, the reference to Paragraph 812 for wiring should be changed to Paragraph 811. *Explanation.*—Paragraph 811 covers wiring and Paragraph 812 refers to weights.

Paragraphs 815, 818, 819 and 823, pages 159, 160 and 167.—The reference in these paragraphs, reading as follows: "See Paragraphs 809 and 812 for wiring and staking" should be changed to read "See Paragraphs 806 to 811, inclusive, for wiring

and staking." *Explanation.*—Paragraphs 809 and 812, at present referred to, do not cover wiring and staking instructions.

Fig. 76, page 163.—In the explanatory note of Fig. 76 the word "intermediate" at the end of third line from bottom of page should be changed to "this." *Explanation.*—To clarify meaning of the note.

Rule Governing Loading of Boxed Automobiles on Flat and Open Top Cars

The following rule governs the loading of boxed automobiles on flat and open top cars:

Single Tier Loading—Flat Cars—Figs. 100-P, 100-Q, 100-R, 100-S, 100-T.

1358. End plank to be 2 in. by 6 in., preferably one piece, extending entire width of load and securely toe-nailed to car floor. See Figs. 100-P, 100-R, 100-S and 100-T.

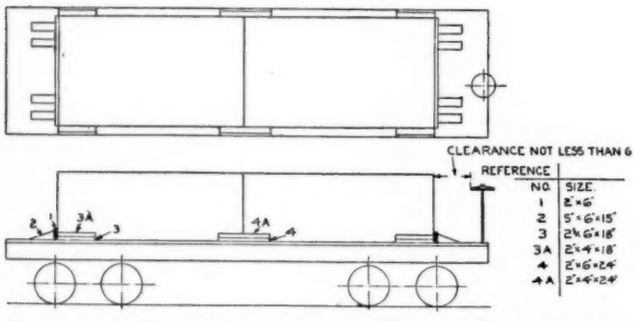


Fig. 100-P—Boxed Automobiles—Side and End Blocking. One Box to Width of Car

1359. Where there are two boxes to width of car, each box must have at least two heel blocks per end. See Figs. 100-R, 100-S and 100-T.

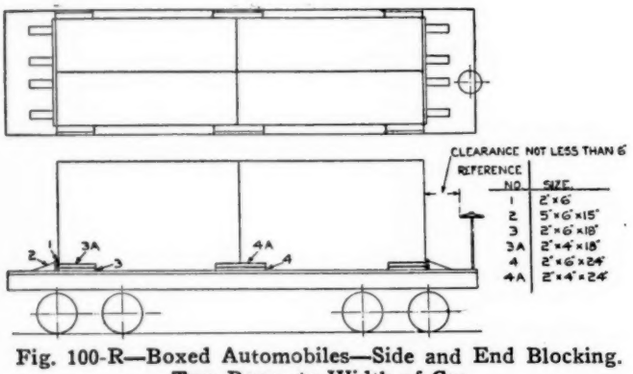


Fig. 100-R—Boxed Automobiles—Side and End Blocking. Two Boxes to Width of Car

1360. Where there is but one box to width of car, there must be at least four heel blocks per end. See Fig. 100-P.

1361.—Heel blocks to be at least 5 in. high, 6 in. wide and 15 in. long, each block to be secured to car floor with six 40d nails (cement-coated preferred). See Figs. 100-P, 100-R, 100-S and 100-T.

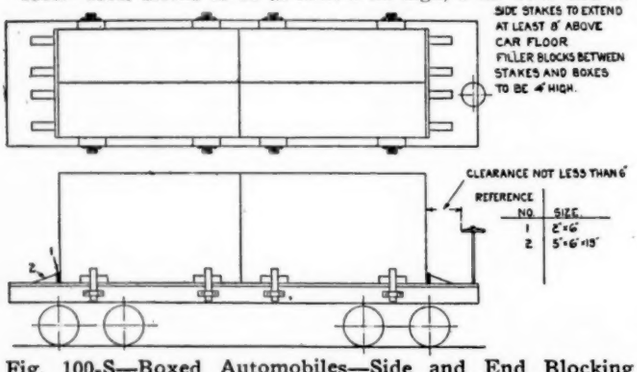


Fig. 100-S—Boxed Automobiles—Side and End Blocking When Side Stakes are Used

1362. Heel blocks 4 in. high, 4 in. wide and 15 in. long may be used, provided one additional block per box is used, blocks to be secured to floor with four 40d nails (cement-coated preferred).

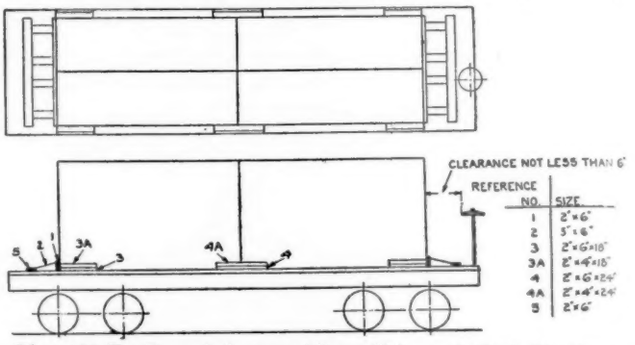


Fig. 100-T—Boxed Automobiles—Side and End Blocking When Weight of Load Exceeds 22,500 Lbs.

1363. Where there is insufficient space at end of load to apply heel blocks, as specified in Paragraphs 1361 and 1362, then plan shown in Fig. 100-Q should be followed for end blocking.

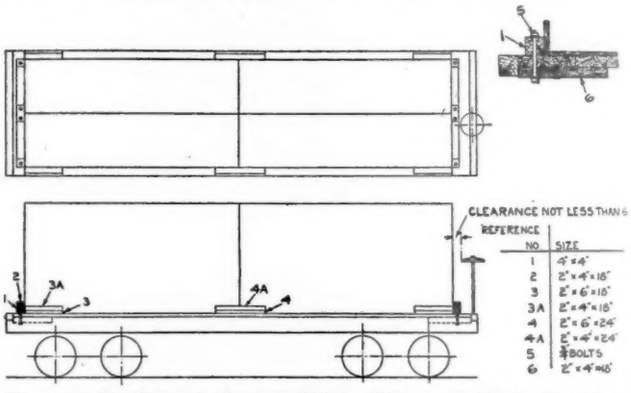


Fig. 100-Q—Boxed Automobiles—Side and End Blocking. Where Heel Blocks Cannot be Used

1364. Side blocking to consist of, preferably, one piece 2 in. by 6 in. securely nailed to floor with 20d nails (cement-coated preferred) and one piece 2 in. by 4 in. securely nailed on top of 2 in. by 6 in. with 20d nails (cement-coated preferred). As an alternative, 4 in. by 4 in. may be used if securely toe-nailed to car floor with 20d nails (cement-coated preferred). Side blocks (end) to be 18 in. long and side blocks (center) to be 24 in. long.

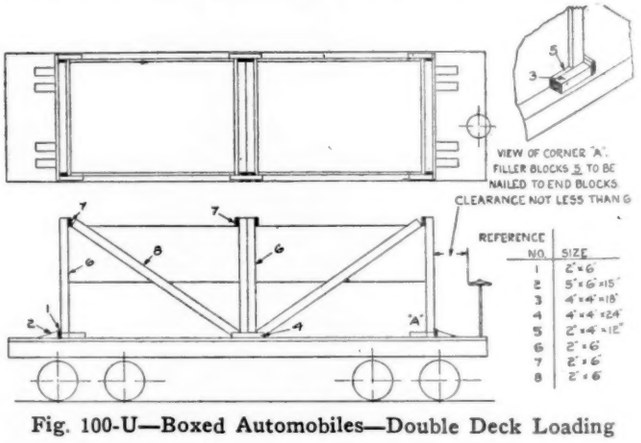


Fig. 100-U—Boxed Automobiles—Double Deck Loading

When there is insufficient space to use side blocks as specified, two side stakes with 8 in. above car floor must be used to each side of each box and space between the box and side stakes must be completely filled in with blocking at least 4 in. high, which must be securely nailed to car floor. See Fig. 100-S.

1365. For loads above 22,500 lb., all heel blocks must be backed up by one plank 2 in. by 6 in. extending full width of load and securely nailed to floor. See Fig. 100-T.

1366. Any arrangement of equal strength to that specified herein will be accepted as an alternative.

Double Tier Loading—Flat Cars—Figs. 100-U and 100-V.

1367. Double deck loading shall be in accordance with Figs. 100-U and 100-V.

When total load exceeds 22,500 lb., reinforced end blocking should be used, as shown in Fig. 100-U.

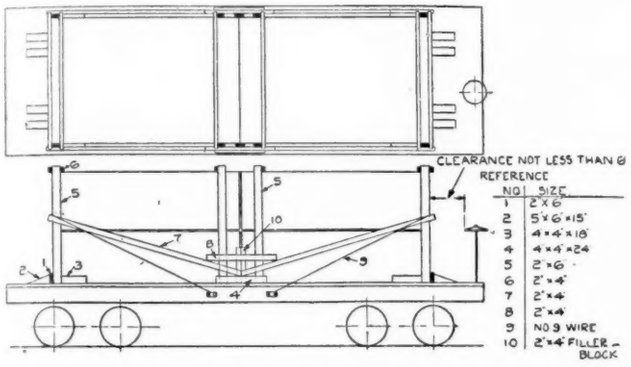


Fig. 100-V—Boxed Automobiles—Double Deck Loading

Any arrangement of equal strength to that specified herein will be accepted as an alternative.

Pyramid Loading—Flat Cars.—Fig. 100-W.

1368. Pyramid loading shall be in accordance with Fig. 100-W.

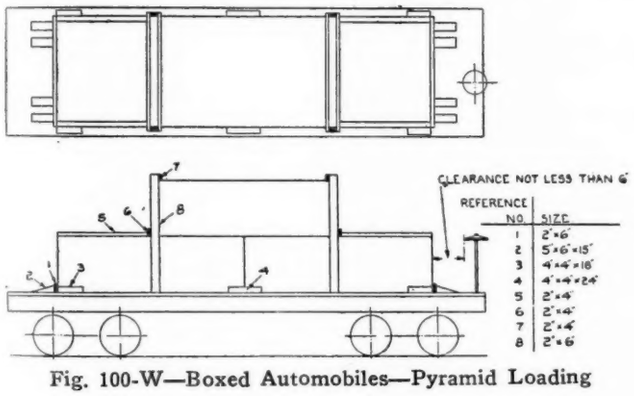


Fig. 100-W—Boxed Automobiles—Pyramid Loading

Any arrangement of equal strength to that specified herein will be accepted as an alternative.

Single Tier Loading in Gondola Cars.

1369. Load may be placed against end gate or end of car opposite brake mast.

The other end of load to be blocked as shown in Figs. 100-P or 100-R. When there is insufficient space at end of load to use heel blocks, one 2 in. by 6 in. extending full width of load and securely nailed to floor of car with not less than 20d nails (cement-coated preferred) may be substituted.

Any arrangement of equal strength to that specified herein will be accepted as an alternative.

Double Tier and Pyramid Loading in Gondola Cars.

1370. Load may be placed against end gate or end of car opposite brake mast.

The other end of load to be blocked as shown in Figs. 100-P or 100-R. When there is insufficient space at end of load to use heel blocks, one 2 in. by 6 in. extending full width of load and securely nailed to floor of car with not less than 20d nails (cement-coated preferred) may be substituted.

Boxes at top of load are to be secured in the manner shown on Figs. 100-U, 100-V and 100-W.

Any arrangement of equal strength to that specified herein will be accepted as an alternative.

Proposed Rearrangement of the Loading Rules

It has been decided by the committee to rearrange the loading rules book, with a view of cutting down the number of separate groups of rules that have been issued in pamphlet form. This will be accomplished by placing all rules, such as lumber, timber, logs, ties, etc., in one group. By this arrangement the rules can be reduced considerably in size, as a large number of repetitions of general rules will be eliminated. The following is an outline of the proposed rearrangement:

Group No. 1.—To be included with each pamphlet issued. General paragraphs, pages 1 to 32, inclusive.

Group No. 2.—Rule governing the loading of lumber or timber on open cars. Paragraphs 100 to 168, inclusive.

Rule governing the loading of logs, telegraph and telephone poles, piling and props on open cars. Paragraphs 200 to 249, inclusive.

Rule governing the loading of tan bark, slab wood and lath on open cars. Paragraphs 300 to 314, inclusive.

Rule governing the loading of ties, fence posts and similar material. Paragraphs 400 to 408, inclusive.

Rule governing loading barrel staves, fence posts, wooden billets, lath, tan bark and similar short wood in box or stock cars. Paragraphs 2100 to 2106, inclusive.

Rule governing loading of ties in box or stock cars. Paragraphs 2200 to 2207, inclusive.

Rule governing loading of barrels in box or stock cars. Paragraphs 2000 to 2006, inclusive.

Group No. 3.—Rule governing the loading of structural material, plates, girders, etc., on open cars. Paragraphs 500 to 566-J, inclusive.

Rule governing the loading of rolled material of small sectional area, short billets, rails, small castings, wheels and tires on open cars. Paragraphs 600 to 612, inclusive.

Rule governing the loading of turntables. Paragraphs 700 to 723, inclusive.

Rule governing the loading of mounted wheels on open cars. Paragraphs 1600 to 1608, inclusive.

Rule governing loading tires in box or stock cars. Paragraphs 2300 to 2307, inclusive.

Rule governing loading of car wheels in box or stock cars. Paragraphs 2400 to 2407, inclusive.

Rule governing loading of metal sheets or plates in box cars. Paragraphs 2900 to 2908, inclusive.

Rule governing the loading of pipe on open cars. Paragraphs 800 to 823, inclusive.

Rule governing loading of scrap, junk and similar material on cars with or without racks. Paragraphs 1700 to 1708, inclusive.

Rule governing loading of iron ore, limestone or similar material on open cars. Paragraphs 1800 to 1805, inclusive.

Group No. 4.—Rule governing the loading of cylindrical boiler shells or tanks. Paragraphs 1100 to 1120, inclusive.

Rule governing loading of engines and similar machinery. Paragraphs 1200 to 1212, inclusive.

Rule governing loading of heavy machinery such as lathes, planers, boring machines, etc., in box or stock cars. Paragraphs 2600 to 2606, inclusive.

Rule governing loading greased shaftings in box or stock cars. Paragraphs 2700 to 2707, inclusive.

Rule governing the loading of mining cars, dump cars, and similar vehicles on open cars. Paragraphs 900 to 913, inclusive.

Rule governing loading of derrick cars, steam shovels, and similar pivoted machinery. Paragraphs 1400 to 1410, inclusive.

Rule governing loading of plate glass on flat or gondola cars. Paragraphs 1500 to 1507, inclusive.

Rule governing loading of scrap, junk and similar material on cars with or without racks. Paragraphs 1700 to 1708, inclusive.

Group No. 5.—Rule governing loading concrete culvert pipe on flat cars. Paragraph 824.

Rule governing loading of stone or brick on open cars. Paragraphs 1000 to 1023, inclusive.

Rule governing loading brick and building tile in box or stock cars. Paragraphs 1900 to 1907, inclusive.

Rule governing loading of sewer pipe or drain tile in box or stock cars. Paragraphs 2500 to 2507, inclusive.

Group No. 6.—Rule governing loading of automobiles, trucks and trailers on freight cars. Rules 1300 to 1357, inclusive.

The attention of your committee has been directed to certain drop end gondola cars, recently constructed, in which the reinforcement for the corner stake at end of car narrows the drop end gate opening to such an extent that such cars are practically useless for twin shipments loaded on floor of car, requiring 18 in. clearance on each side of the lading for curving. It is suggested that this subject be referred to the car construction committee with the recommendation that a minimum width clear opening be established between corner stake reinforcements for cars of future construction so that these cars, which are a mill district car, may not be barred from hauling twin shipments.

The report is signed by R. L. Kleine, Pennsylvania; J. J. Burch, N. & W.; E. J. Robertson, Soo Line; J. E. Mehan, C., M. & St. P.; Samuel Lynn, P. & L. E.; Ira Everett, L. V.; T. O. Sechrist, L. & N.; E. N. Harding, I. C. and G. R. Lovejoy, Detroit Terminal.

Discussion

R. L. Kleine (Penna.), chairman of the committee said: The work of your Loading Committee during the past year consisted mostly of considering the changes recommended by members and shippers, particularly steel and automobile shippers. We held a number of joint conferences with these shippers, and I am glad to say that our conference work has gone along satisfactorily. The steel shippers, however, still have some objections to our requirements. They think they are too rigid, but we are ironing them out from time to time. Your committee does not feel like making any changes in the rules where a question of safety is involved, or where in their opinion there is any doubt as to a question of safety.

For example, there was a meeting of steel shippers yesterday afternoon to consider the binder question on double loads. They wanted a modification in the number of binders specified last year. The committee had considered that at two previous meetings. It did not feel that any further modifications could be made. The suggestion was offered that where three binders had been specified in the double load—formerly only one was required—we would try out the omission of the centre binder. This committee would like to have authority to do that without making any change in the rules, and with the idea that if it does not get us into any difficulties, we will recommend that change during the year.

The composite spacing block has been tried out and found to be very successful, and therefore the committee would recommend that as a substitute for the present composite block, the standard steel spacing block not to be changed. The recommendations of the committee on automobile loading are the result of joint conferences with the shippers. There is no disagreement in regard to the details presented.

A motion was made and seconded that the report be received, and submitted to letter ballot.

W. F. Kiesel, Jr. (Penna.): The Loading Committee has put up a question to the Car Construction Committee in the last paragraph which cannot be answered unless we have a specified design of car. It would be preferable if the Loading Committee would specify the narrowest limits we can work to, so that the Car Construction Committee could state, when the question of designing comes up, whether or not the design can be made to conform with these rules.

Mr. Kleine: It is not a question of the narrowest limits we want there; it is a question of the widest limits. I believe the Car Construction Committee ought to set a minimum. This particular feature was brought out very strongly by the steel shippers. There have been a number of drop-end gondola cars designed to carry products into the mills, and they cannot be loaded out on account of the narrow clearance at the drop-end gate. To reinforce the corner post drop-end gate, plates of such width have been used that there is insufficient room for fully loading the car, and it is within the province of the Car Construction Committee at least to recommend a minimum width of opening.

Samuel Lynn (P. & L. E.): We are building a car for the purpose of loading long material. Then we get the wide gusset plate, and we get the car out of the service for which it is built. That is a matter which the Car Construction Committee should consider.

P. P. Barthelemy (Great Northern): On our road we haul a great deal of lumber, double loads and long timbers, and we have experienced considerable trouble with that class of car. The construction ought to be such that we would have practically as large clearance at the end gate, with the exception of some slight reinforcement, as the general opening between the posts of the car.

C. F. Giles (L. & N.): We all recognize the authority of this association to make rules, but it is up to the individual members of the association to see that these rules are carried out. A great deal of dissatisfaction and trouble, and great delays, are caused at interchange points by reason of the fact that cars are not loaded in accordance with the loading rules, and the interchange point is not the place for this thing to be taken care of. It should be taken care of at the point where the cars are loaded, and this applies especially to the way in which the lading is put on the cars and the protection of the side doors.

On our road, and I have no doubt that many other roads have the same experience, many cars are stopped at interchange points by reason of the doors not being properly protected. I want to emphasize the importance of individual members of the association handling the matter with proper authority to see if the cars cannot be properly laden at loading points.

Chairman Tollerton: The chairman will be glad to extend the privilege of the floor to the steel shippers who are present at the meeting, and we will be glad to hear from them.

Charles Orchard: I think Mr. Kleine has summed up the arguments we introduced in our conferences in respect to the additional clearances desired. It is a matter of intensive loading—we desire to get the largest possible tonnage on the cars that will be safe. We are held down by the loading rules to 75 per cent of the marked capacity on these floor loads, and where there is considerable space taken up by these gussets, it is impossible to get the required 18 in. clearance. In our desires to avoid any unsafe loading, there is a great probability that the cars will go out short of the loading we desire to get on them.

The gusset braces and braces to the ends of the car restrict us, not only in the weight desired to be loaded on some of the cars, but in the use of the cars at all, and it results in our sending the cars out with loads that are not as safe as they would be otherwise with the larger space. I hope that Mr. Kleine's suggestion can be given careful consideration.

T. H. Goodnow (C. & N. W.): I believe the only way by which we are ever going to enforce the proper loading of cars is to bill back on the originating line for the improper loading, insecure door protection, and features of a similar character. Some roads do not seem to exercise any supervision over these matters, and the car is passed in interchange until it comes to some of the larger gateways, where a closer check is being made, and there it is held up. Unless you can penalize the loading line, instead of the intermediate line, I am afraid that practice will continue as it does at the present time. The question has been up several times and never been acted upon, and possibly it is one for the Traffic Section to settle.

J. S. Neary (Monon): We have many cars loaded in the stone districts and there is some objection from the connecting lines in regard to the end braces. Three-fifths of the flat cars coming into that territory are not equipped with stake pockets. The absence of these stake pockets is the fault of the roads themselves, instead of the stone shippers, and some action should be taken to requite the equipment of all cars with stake pockets.

The motion to accept the report and refer it to letter ballot was put to a vote and carried.

Report on Train Brake and Signal Equipment

PART I—Retaining Valves For Freight Equipment Cars

THE SUBJECT REFERRED to the Committee on Train Brake and Signal Equipment during the past year, on which the following report is submitted, were 10 in number.

The committee recommend in its 1919 report, "for adoption as recommended practice, two-pressure spring type retaining valves of such capacity as may be required by individual roads, leaving the question of standard capacity open for further consideration." This was adopted by letter ballot, and the committee was requested to report on the question of standard capacity for retaining valves of the two-pressure spring type.

The committee appointed a sub-committee to make, subject to the approval of the general committee, such observations and road tests as will be required in determining what capacity retaining valves should be recommended. Pending completion of these observations, the committee reports progress and asks for further time on the question of retaining valve capacity.

PART II—Standard For Air Brakes, M. C. B. Sheet No. 18

It has been suggested that M C. B. Sheet No. 18 should be revised to show (a) the material of which the brake details shown thereon should be made; (b) the omission of the second hole from the end of the dead lever guide which is attached to the bolster, as it is seldom, if ever, practical to connect the

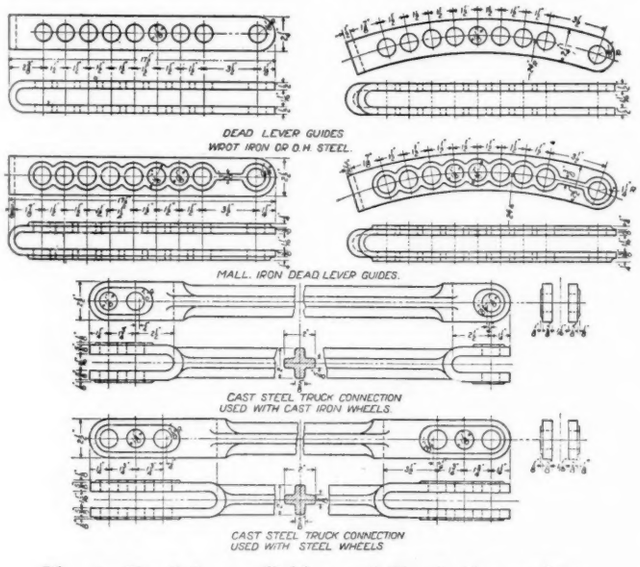


Fig. 1—Dead Lever Guides and Truck Connections

guide at this point to the dead lever; (c) a curved dead lever guide, as straight guides do not always clear the car framing when dead lever is connected close to bolster; and, (d) to provide for dead lever guides made of malleable iron.

All brake details shown on the sheet in question are to be made of wrought iron or steel, except the truck lever connector (bottom rod) which may be cast steel and for which there are no detail drawings. The committee, therefore, recommends replacing the dead lever guide and the note on the use of cast steel bottom rods with the details shown in Fig. 1.

PART III—Brake Chain Failures on Tank Cars

A request was received to report on the failure of hand brake chains on tank cars caused by these chains rubbing on the axle. This investigation was made by a sub-committee which examined a large number of cars, 45 per cent of which were found with hand brake rods and chains arranged as shown in Fig. 2, Group 1, on which these chain failures were to be expected.

Fifty-five per cent of the cars examined by the committee had the parts in question arranged as shown in Group 2, with which there was no indication of the chains coming in contact with the axle.

It is recommended that the chain rods be made long enough to reach the center of axle preferably extend two inches forward

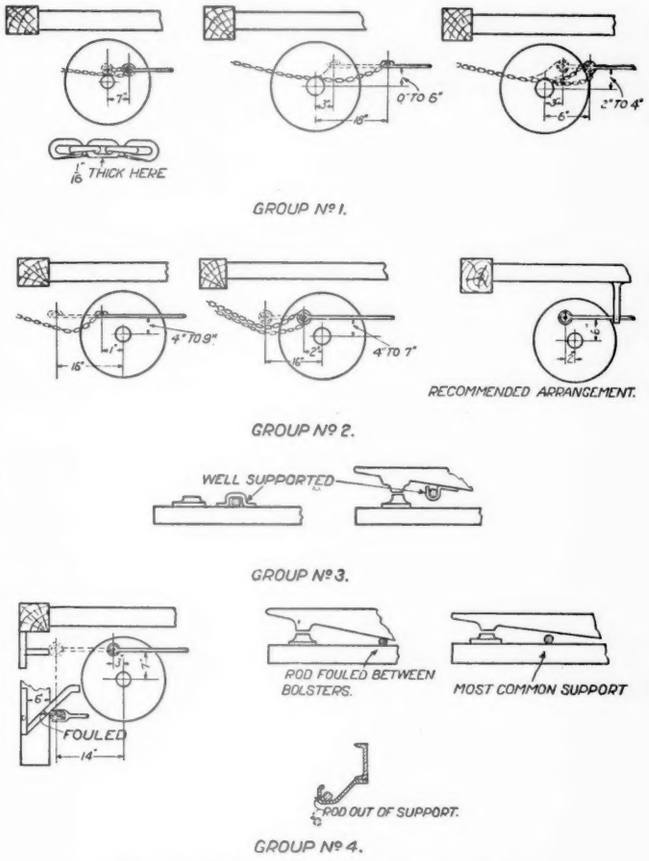


Fig. 2—Hand Brake Chains on Tank Cars

of the axle center and be suspended six inches above the axle, as shown in Group 2. Group 3 shows, as a matter of information, preferred means of suspending the hand brake rod to prevent it coming in contact with the axle.

PART IV—Location of Angle Cocks

The standard location of angle cock on freight cars as shown on M. C. B. Sheet No. 18 is, for wooden cars, 13 in. from the center of the car and 13 in. back of the pulling face of the knuckle, and for steel cars built after 1916, 15 in. from the center of the car and 9 in. back of the knuckle face. These dimensions are tabulated as *B* and *C*, respectively. The sheet also contains a note reading: "Dimension *B* must bear a fixed relation to dimension *C*. When dimension *B* must be increased or decreased from dimensions shown in table, dimension *C* shall be determined from the formula $C = 39 - 2B$."

C. B. Young advised that through slight variations in construction the angle cock on a large number of new cars built for the U. S. R. A. is 15½ in. and 9 in., respectively, from center of car and knuckle face, and recommended changing the formula on M. C. B. Sheet No. 18 to $C = 40\ 2B$.

This subject was referred to a sub-committee to investigate the question of clearance between couplers and angle cocks or hose, possible stretching of hose with draft gear under tension and cars on curves, and the effect on air hose of the angle of the cock key to the vertical. The sub-committee's findings are shown in the accompanying drawings.

Fig. 3 shows at Section *AA* a clearance of practically ¼ in. between the guard arm of the type *"D"* coupler and hose adjacent to angle cock on a car measuring 33 ft. 10 in. over striking faces, with the car on a 66-ft. radius curve, the brake pipe located 15½ in. from center of the car, the angle cock key 9 in. back of the "neutral coupling line" and the coupler against the side stop.

Substantially the same clearance is shown in Fig. 4 for a type "D" coupler on a U. S. R. A. 50-ton low-side gondola car having the brake pipe located 15½ in. from the center of the car and the angle cock 8 in. back of the pulling face of the coupler and at an angle of 30 deg. from the vertical. This clearance is increased to 1⅛ in. with the angle cock 20 deg. from the vertical.

Fig. 5 shows the relative position of adjacent angle cocks on two cars, of the length shown in the drawing, coupled on a No. 6 crossover, with brake pipe and angle cocks in the several positions indicated in the table. It will be noted from Column *D*, under 30 Degrees, that the proposed change in the formula is equivalent to shortening each air hose 7-16 in., which the committee does not believe should be done. It will also be noted by comparing Columns *D* under 30 and 20 Degrees, that making the angle of the cock key less than 30 deg. from the vertical is equivalent to shortening the hose in substantially the same ratio as increasing the distance from the center of the car to the center of the brake pipe.

The committee has also made some experiments to determine if reducing the angle of the cock to the vertical, to provide better clearance between the hose and the coupler guard arm, would have an important bearing on kinking the air hose. It is found that when cars are on straight track and the draft gear compressed solid, there is slightly less kinking of the hose with a 20 deg. angle than with the 30 deg. angle; but when the adjacent angle cocks on two cars coupled are in their extreme positions, on curves with the draft gear under tension, the 30 deg. angle is the preferable one; and, owing to difficulty which has been experienced with hose couplings leaking at the packing rings in cold weather, changing the angle of the cock is not considered advisable.

It is conclusive from the foregoing that the brake pipe on a car having type "D" couplers with a side movement of 2½ in. should be not less than 15½ in. from the center of the car at the angle cock. The committee, therefore recommends that no change be made in the present standard location of angle cock, but that a new line be added to the table on M. C. B. Sheet No. 18 showing *B* and *C* to be 15½ in. and 8 in., respectively, for new cars or cars having type "D" couplers.

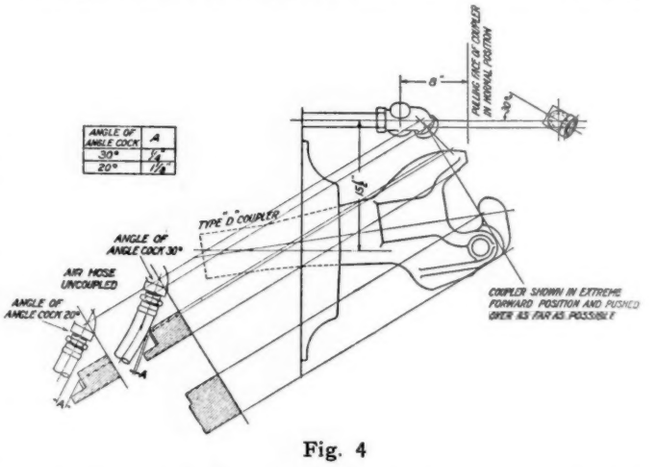


Fig. 4

PART V—Text For Standard Manual

The committee has prepared and submitted to the secretary, for the standard manual, text on (a) air brakes, (b) use of air brake defect card, (c) air brake hose, (d) gages for air brake hose, (e) gage for air brake hose coupling packing rings, and (f) air brake appliances.

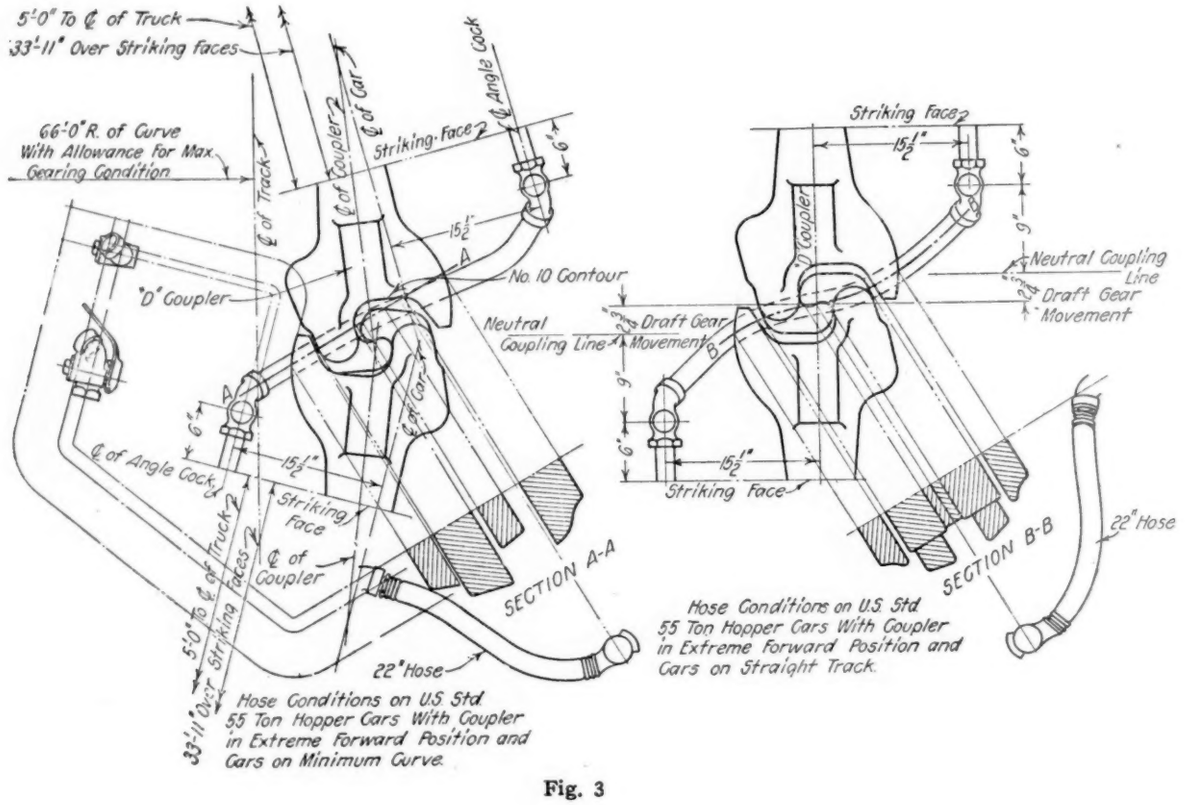


Fig. 3

Part VI—Automatic Hose Connectors

Owing to the magnitude of this subject, the committee has done little more than outline a plan to be followed in investigating the subject, and reports progress and recommends that the subject be continued, for which a special committee should be appointed or another member added to the Train Brake and Signal Committee, in order that a sub-committee may be selected to handle the subject of automatic connectors.

Part VII—Substitution of Triple Valve—Cleaning and Stenciling Cylinders and Triples

The proper substitution of triple valves when making repairs to freight cars in interchange service has been the subject of

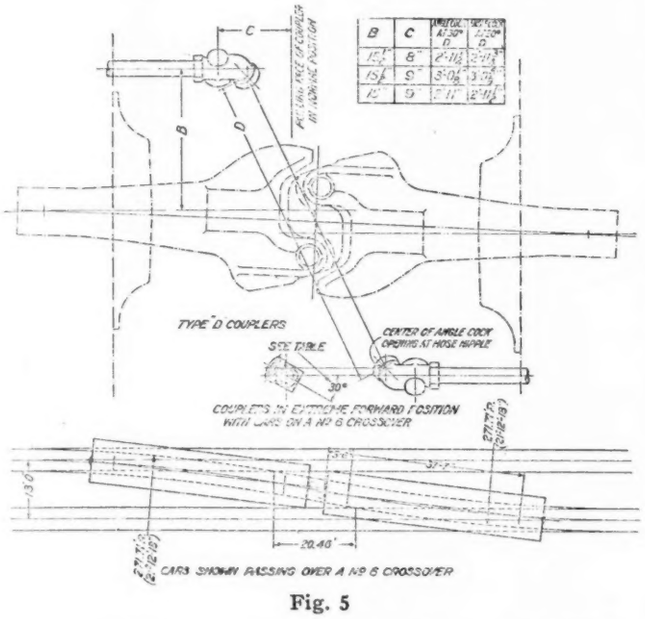


Fig. 5

some correspondence between the Arbitration Committee and this committee, the latter committee's recommendations having been submitted to and approved by the Arbitration Committee.

Part VIII—Brake Cylinder Packing

The question of leather substitutes for brake cylinder packing has been considered, and, due to the conflicting results of tests conducted on the several roads represented on the committee, the committee does not feel that it could consistently recommend the use of brake cylinder packing made of leather substitutes. It is recommended, however, that the subject be continued for further investigation.

Part IX—Cleaning, Lubricating and Testing Triple Valves

The present instructions on lubricating triple valves provide for the application of more graphite than the committee believes should be used, and it is recommended that Section 13 in the standard instructions on cleaning, lubricating and testing triple valves be revised to read: "Lubricate the seat and face of the slide valve and slide-valve graduating valve with high-grade, very fine, dry graphite, rubbing it on to the surface and the upper portion of the bushing where the slide-valve spring bears with a flat-pointed stick, over the end of which a piece of chamois skin has been glued, taking care to work the graphite into the pores of the metal, but leave no loose graphite on the seat. The chamois skin can be dispensed with provided the stick is made of soft wood, such as white pine, which will easily hold all the graphite that can be rubbed into the surfaces of the metal. The parts to be lubricated with graphite must be free from oil or grease."

Part X—Adjustment of Brake Power on Freight Cars

This subject was received too late for the committee to take action on this year, but it is the belief of the committee that the present requirements for adequate hand brake power on cars other than tank cars are very indefinite, and that the correctness of the requirements will have to be demonstrated by actual trial. The committee will consider this subject during the coming year.

The report was signed by T. L. Burton (Chairman), New York Central; B. P. Flory, New York, Ontario & Western; J. M. Henry, Pennsylvania; L. P. Streeter, Illinois Central; R. B. Rasbridge, Philadelphia & Reading; G. H. Wood, Atchison, Topeka & Santa Fe, and H. M. Curry, Northern Pacific.

Discussion

T. L. Burton (N. Y. C.): At a recent meeting of the committee a communication was read from R. W. Bell of the Illinois Central calling attention to damaged freight equipment caused by bursted air hose, and also calling attention to some consideration which had been given that subject by the Air Brake Association, and urging the importance of something being done to relieve the situation. In due course this subject will receive the proper consideration of the committee. Meanwhile attention is called to the standard practice which was adopted last year of testing air brake hose with soap suds when cars receive testing or air brake repairs on shop and repair tracks, which, if properly followed up, should afford great relief from the source complained of.

A motion to accept the report and refer such items as are necessary to letter ballot was made and carried.

Report of the Committee on Resolutions

C. E. Chambers, chairman of the committee, submitted the following resolution:

Resolved, That Section III Mechanical, of the American Railroad Association, is opposed to legislation making the use of the metric system of weights and measures obligatory to the exclusion of the English system or the American system at present in general use.

A motion to adopt the resolution was made and carried.

Change in Name of Section

Mr. Fuller presented the following resolution:

Resolved, That it is the sense of this convention that Section III—Mechanical does not clearly indicate the scope and identity of the organizations interested; that these organizations have functioned for so many years and are recognized more clearly by the original names, that the name of Section III—Mechanical, be changed to read "American Railroad Association, Section III—Master Mechanics, Master Car Builders, and Subordinate Mechanical Organizations," this being more clearly in line with the other sections which have retained their individual names in the reorganization.

Mr. Brazier: I am a member of the Committee on Resolutions, and I want to say that this thing is very near to my heart. There is nothing like a good name, and there is no name in the history of American railroading that stands higher than the names Master Car Builders' Association and American Railway Master Mechanics' Association, in this country and in Canada. (applause).

A motion that the resolution be adopted was made and carried.

Mr. Fuller: In connection with the resolution adopted by the convention Monday last, to the effect that presiding officers rotate annually, we wish to offer the following resolution:

Resolved: It is the sense of this convention that the Nominating Committee be instructed to consider only members of the General Committee when nominating members for presiding officers, i. e., Chairman and Vice-Chairman; also, that

in so far as possible past-presidents of the organizations be considered for members of the General Committee, not to exceed one-half of the total personnel of the committee.

A motion to adopt the resolution was made and carried.

Mr. Fuller: The committee desires to offer the following:

Resolved, That it is the sense of this convention that when practicable the approved recommendations of this organization be put into practice on locomotives, cars and in shops, and that executive officers be requested to lend their good offices to bring about this result.

A motion that the resolution be adopted was made and carried.

Mr. Fuller presented the following:

Whereas, The Railway Supply Men's Association has gathered together for our benefit the largest and most comprehensive exhibit of railway mechanical machinery and appliances ever collected at one time, have carried out such an acceptable program of entertainment for the members of the section, their friends and families, and without confusion have enrolled the largest attendance of any mechanical convention; and

Whereas, the Atlantic City Hotel Men's Association have in their usual manner provided so acceptably for our welfare and comfort; and

Whereas, the Executive Committee of the American Railroad Association have indicated their fullest approval of the work of the section in the convention, together with enthusiastic inspiration for future work; and

Whereas, the meetings have been so ably planned and guided by the officers, and special thanks are due the secretary for his untiring efforts and for the very able manner in which committee meetings have been handled and reports furnished in ample time for perusal before the meetings; therefore be it

Resolved, that the appreciation of Section III—Mechanical of the American Railroad Association be extended to the Railway Supply Men's Association for preparing the exhibits and furnishing our entertainments; the Atlantic City Hotel Men's Association; the management of Young's Steel Pier for the improvement made since our last convention, and the co-operation so freely given; the Executive Committee of the American Railroad Association, and the secretary and retiring officers of the section; and to the *Railway Age* warm thanks are extended for the up-to-the-minute reports of our proceedings.

A motion to adopt the resolution was made and carried.

A motion that a vote of thanks be extended to the Resolutions Committee for the work they have done in connection with these resolutions and others that have been offered was made and carried.

Report on Train Lighting and Equipment

THE COMMITTEE WAS INSTRUCTED to prepare, in so far as it was possible, a specification for axle generators. Similar work had been assigned to a committee of the Association of Railway Electrical Engineers. The members of the committee were also members of the A. R. E. E. Committee and the two committees therefore decided to hold joint meetings.

Representatives of the axle generator manufacturers were invited to attend the meetings of the committee and considerable correspondence was conducted with them and also with the manufacturers of ball bearings.

Before presenting the result of the work of the committee in the shape of a specification, it seems desirable to discuss, in more or less detail, the various features that were considered. This discussion will serve to explain why certain items, which form a part of a complete specification were omitted; and why items that were included were finally decided upon.

Generator Frame Material

Generator frames may be made of rolled or cast steel or of cast iron. Cast iron is lower in cost per pound than steel, but has a lower magnetic permeability, therefore requiring a greater weight to obtain the same electrical effect. From a service standpoint each material is acceptable and the decision which to use is really based on economic considerations; modified by the space requirements that must be observed. Where space is a factor, the frame should be of cast or rolled steel. Where space is not a factor, cast iron may be used.

Armature Shaft Material

Armature shafts were formerly made of mild steel and trouble with these shafts breaking or bending at the pulley end, was encountered. This trouble was probably due in some cases to the strain caused by excessive belt tension, in others to the shock of coupling or to torsion developed when the bearings seized. The use of ball bearings has practically eliminated the latter cause and at the same time, has necessitated, in order to mount properly the bearing and permit its removal and reapplication, the use of a better grade of steel. It, therefore, seems desirable to specify the characteristics that a steel suitable for this purpose should possess.

Assembly of Armature

For years the armatures of axle generators were built with the laminations and end plates keyed directly to the armature shaft, a construction that necessitated scrapping the armature when the shaft was damaged. Modern armatures of all types of electrical machines have the laminations and end plates and also the commutator assembled on a quill and the quill is then keyed to the shaft. This construction permits the removal and replacement of the shaft.

Bearings

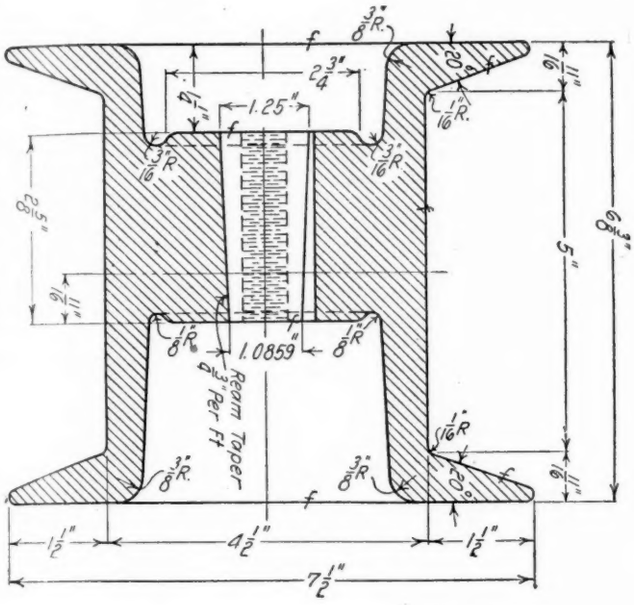
The sleeve bearings that were originally used on axle generators were a most prolific source of trouble, due to wearing, running hot and seizing. Also the bearings were not interchangeable, almost every make and type of generator requiring a different bearing. These conditions required that the bearings be frequently and carefully inspected, as excessive wear would permit the armature to drop and strike on the pole face damaging both field and armatures. In order to guard against this condition and postpone the day on which it would be necessary to renew the bearings on account of legitimate wear, it was customary to design the generator with an air gap having a liberal mechanical clearance, which of course tended to increase the size of the generator and also the cost. Ball bearings seemed to offer a remedy for this trouble, inasmuch as they had been standardized by the manufacturers in a series of definite sizes, so that ball bearings of any given size, no matter by whom manufactured were interchangeable and due to the construction of the bearing the clearance of the air gap could be reduced materially without danger to the armature striking on the pole faces.

The movement to standardize ball bearings was started at the time the use of ball bearings was first begun. After consultations with the ball bearing and axle generator manufacturers a series of sizes was selected and reported by the committee. (See M. C. B. Proceedings, Vol. 51, 1917, Page 98, and Vol. 52, 1918, Pages 137 and 1007.)

The committee recommends that two additional sizes be added, as shown in the table on sizes of ball bearings, as given in the specification.

It is essential to obtain good service that ball bearings be not overloaded and also the manner in which the bearings

are mounted is of great importance in determining the service to be obtained. Thus one bearing must approximately be fixed in position, while the other must have a longitudinal movement so that it can accommodate itself to the change in length of the armature shaft as these changes occur with



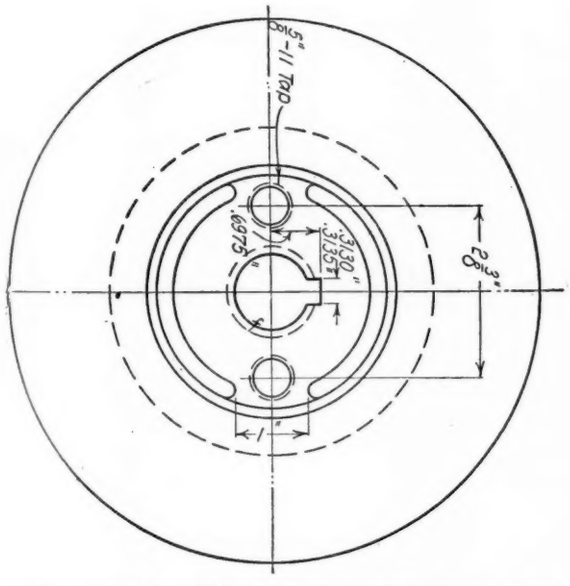


Fig. 1—4½ in. Pulley for Controlled Speed Generator

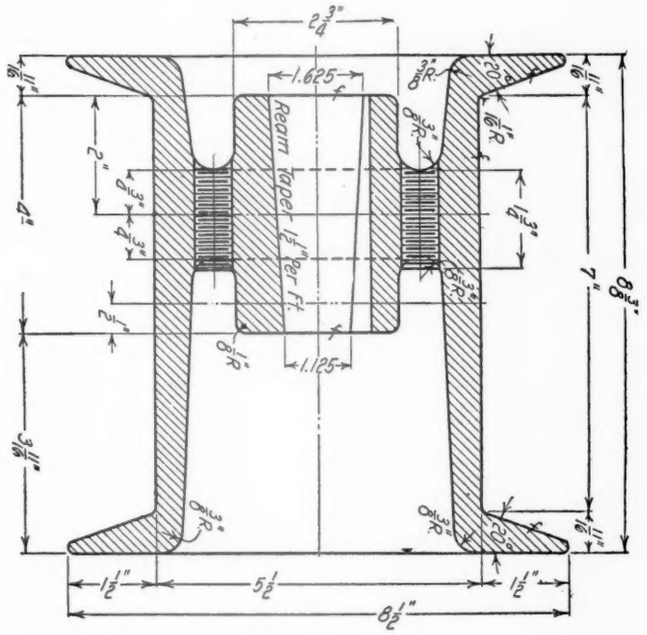
varying temperatures. The load on a bearing is either radial, thrust, or a combination of the two. From the nature of the design the greater part of the radial load must be borne by the pulley bearing, and it is therefore, customary, in order to equalize the load, to make the commutator end-bearing sustain the thrust.

It is also essential that a proper fit of the shaft in the bearing and of the bearing in the housing be obtained. If the shaft is too small or the housing either too large or too small, the bearing will not function as a bearing. If the shaft is too large the inner race of the bearing will probably crack when the attempt is made to mount the bearing on the shaft.

In the past such terms as "sucking fit," "press fit," and "light drive fit," were used to describe the various kinds of fit desired, but these terms were not accurate and it seems best that certain dimensions with allowable tolerances be fixed. The question was therefore taken up with the ball bearing manufacturers and information obtained relative to the above, together with corresponding data concerning the bearings themselves.

Grease Retainers

When sleeve bearings were used, oil was the lubricant employed, and this oil would travel along the shaft and into frame, where it would become mixed with carbon dust and cause grounds; or become deposited on the commutator causing the generator to fail to generate. With ball bearings, which in this service, ordinarily use grease as a lubricant; the same trouble is sometimes experienced during very warm weather, if an excessive amount of grease be placed in the bearing and some provision be not made to retain it. This trouble can be prevented if grooves be machined in the bore of the end housings and felt washers fitting the shaft snugly be applied to the inner side of the commutator end housing and to both sides of the pulley end housing.



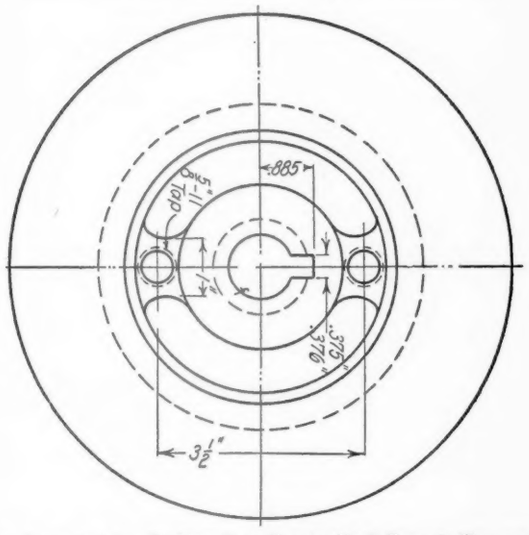


Fig. 2.— 5½ in. Pulley for Controlled Speed Generator

Pulleys, Pulley Nuts and Keys

In past years the committee has made recommendations relative armature pulleys, pulley nuts and keys, see M. C. B. Proceedings as noted on the next page.

Vol. 45	1911	Page	342
" 47-1	1913	"	414
" 49-1	1915	"	424
" 51	1917	"	102
" 46	1912	"	331
" 48-1	1914	"	332
" 50-1	1916	"	380

Drawing Sheet U-7, A. R. A.

The idea on which these recommendations were based was to standardize fully the armature pulley so that renewals could be promptly made to foreign cars, and three sizes,

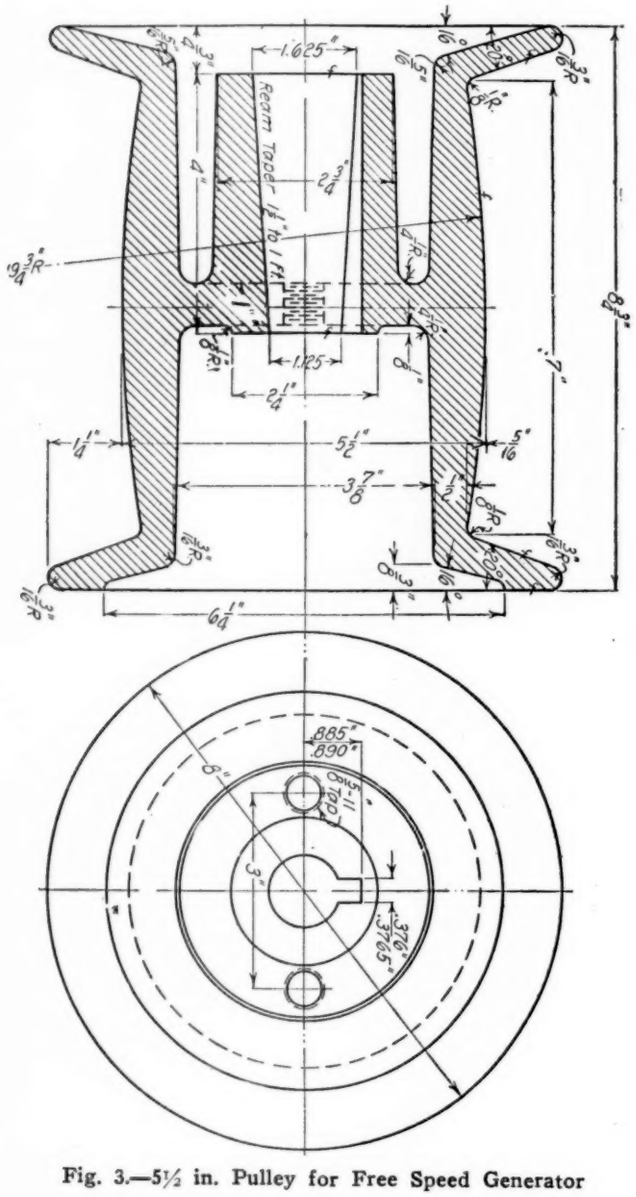


Fig. 3.—5½ in. Pulley for Free Speed Generator

i. e., 5½ in., 8 in. and 11 in. diameter were selected. It now appears advisable, in view of the advent of the "controlled speed" axle generator and what will later be said on the subject of "capacity" and "minimum full load speed," to increase the number of pulleys as determined by the diameter, while retaining the other dimensions, such as bore, taper, etc., which will enable one to renew a broken pulley even though the pulley applied be not of proper diameter to obtain the minimum full load train speed for which the generator was intended.

Armature pulleys have been made of pressed steel, cast steel, malleable iron, cast iron and various composite structures. General experience indicates that of these various materials, cast iron, everything considered, is the most suitable for the work, and that much of the trouble that has been experienced with cast iron pulleys has been due to the design.

The committee has therefore prepared design for cast iron pulleys in the following sizes:

Controlled speed generators Diameter of pulley—inches	Free speed generators Diameter of pulley—inches
4½	5½
5½	6½
	8
	10

The designs being such that it is hoped that the trouble, i. e., broken flanges, will be at least partially overcome. These designs are shown on Figs. 1 and 2 for controlled speed generators and Figs. 3 to 6, inclusive, for the free speed generators.

Pulleys of these designs for free speed type of generators are interchangeable for all makes and sizes of generators of the general type having the pulley fit shown on drawing U-7 for axle generator having ball bearings.

The size of the armature pulley that should be used in any given case will depend upon the maximum load, the mini-

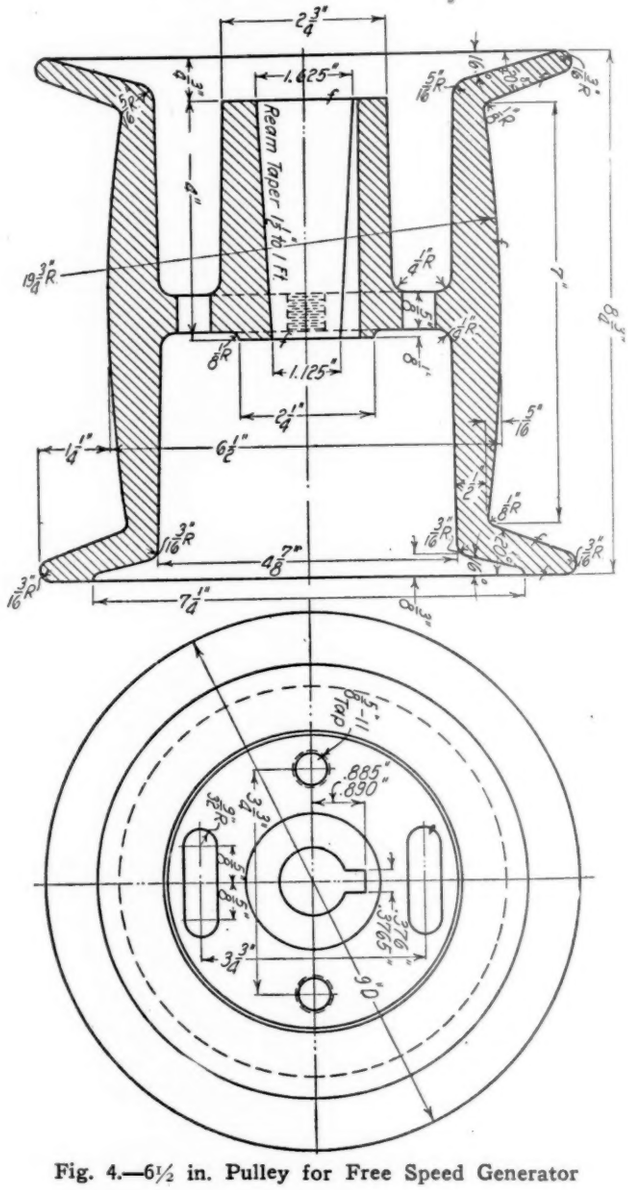


Fig. 4.—6½ in. Pulley for Free Speed Generator

mum full load speed desired, the pulley ratio, the maximum size pulley permissible and the belt clearances.

The present recommended standard armature pulley nut is of the castellated type as shown on M. C. B. Sheet U-7. It is not practicable to use a castellated nut on pulleys less

than 8 in. in diameter on account of lack of space to insert the cotter pin. Furthermore with the pulley seat having a taper of 1½ in. per ft. it is not always possible to turn the nut forward so that the slots in the nut coincide with the hole in the shaft and the nut must therefore be backed off to permit insertion of the cotter. This leaves the pulley loose on the shaft and the keyways are soon ruined. The committee has recommended that the castellated nut and cotter key be eliminated and that a locking nut of a type acceptable to the purchaser be used. (See M. C. B. Proceedings, Vol. 51, 1917, Page 102.)

Field Coils

When field coils are constructed so that there are no means other than the outer layers of tape, for holding the several turns fixed in their relation to one another, movement of the several turns results due to the vibration occurring from service conditions.

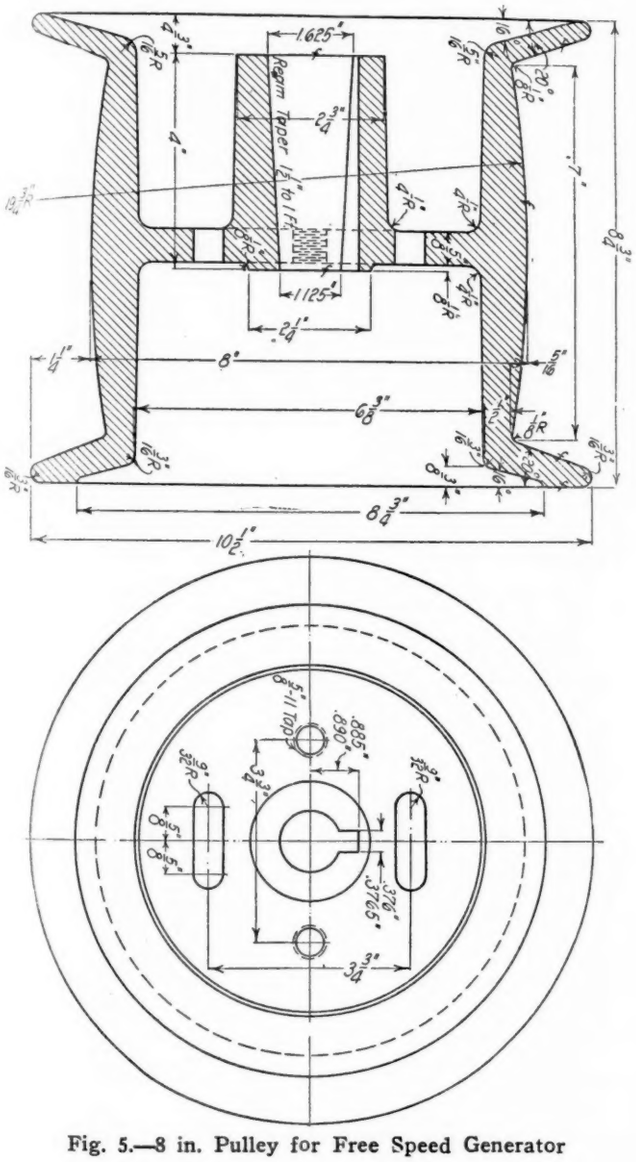


Fig. 5.—8 in. Pulley for Free Speed Generator

As the cotton insulation that is generally used, will in time char due to the heat generated by the operation of the generator, this movement will flake off the charred insulation and the turns will be short-circuited, or in other words, the coil will be burned out. The vibration will, in time, similarly affect a similar coil insulated with Class "B" insulation. It is therefore important that the several turns and layers be so held that no relative movement can occur. This can be accomplished by impregnating the coils with an insulating compound which binds the several layers and turns into one solid mass so that no relative movement can result. Therefore field coils should be impregnated to conform with established practices of electrical manufacturers or thoroughly saturated by dipping process with insulating material and then baked.

Air Gap

The smaller the air gap, that is, the distance radially between the iron of the armature and the pole face the less the reluctance of the magnetic circuit, and therefore the less the number of ampere turns which are required to energize the field. Decreasing the air gap therefore tends to reduce the size of the generators and also its first cost. The use of ball bearings permits the use of a small air gap as little provision for wear is necessary. Experience has shown that when using ball bearings, the mechanical clearance in the air gap will be sufficient, if it is possible to pass in a direction parallel to the shaft, at all points between the armature and the pole faces an oval feeler ½ in. wide and 0.05 in. thick.

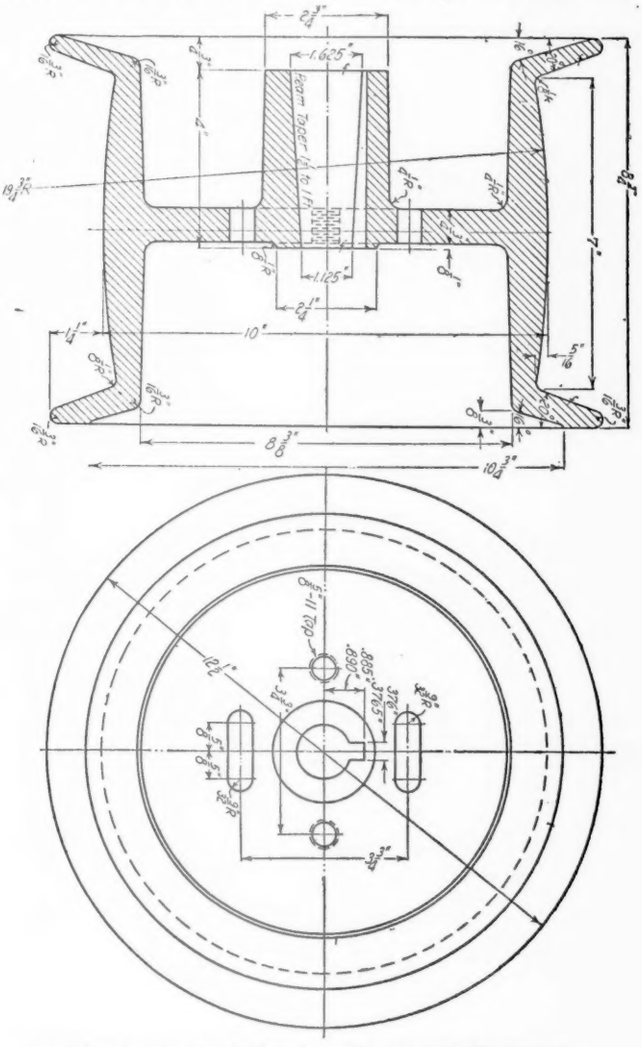


Fig. 6.—10 in. Pulley for Free Speed Generator

Regulator—Location of Holes for Supporting Bolts

The two Z-bars or other shapes by which the generator and lamp regulator panels are supported are ordinarily, most conveniently placed in the regular cabinet in a vertical position. Therefore, if the horizontal distance between the centers of the holes in the panels through which the supporting bolts pass is standardized, one location of these regulator supports may be employed which will tend to simplify the car construction. It is, of course, desirable that the vertical centers of the same holes be also standardized but not so

important as it is for the horizontal holes. The committee investigated this matter and found the horizontal center of these holes varied from 13 to 14¾ in. while the vertical centers varied from eight to 31 in.

By agreement with the axle generator manufacturers, the width of all panels, both generator and lamp regulator panels has been made 16 in. and the horizontal distance between

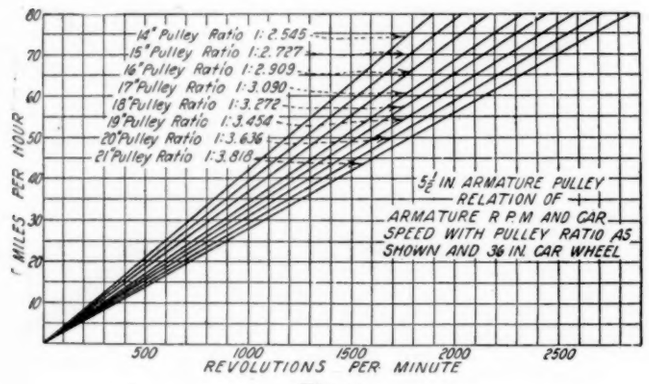


Fig. 7

center of holes which are 7/16 in. in diameter, has been made 14 in., they being placed 1 in. from each side and also 1 in. from each end of the panel.

In order to prevent the supporting frame work short-circuiting the wiring on the rear of the panels, it is frequently necessary to have clearance at this point.

The corner bracket used for this purpose to be interchangeable and to make all panels interchangeable should be designed so that the holes for the supporting bolts shall be the same size as the hole in the panel, i. e., 7/16 in. and when mounted on the panel should have the same horizontal distance between centers, i. e., 14 in.

Minimum Full Load Speed

The minimum r. p. m. of the armature, or the minimum miles per hour of car travel, at which the generator will carry full rated load, is known as the "minimum full load speed."

It will be noted that the relative values of the two ways of expressing this speed will vary with the pulley ratio and size of wheel.

This relation is shown on Fig. 7 to 10, inclusive.

The "minimum full load speed," expressed as r. p. m. of the armature, is a factor of prime importance in the design of the axle generator; a lower r. p. m. generally necessitating a larger generator. Until quite recent years, axle generators were purchased principally for use on cars operated in through service on the main line of railroads, where ordi-

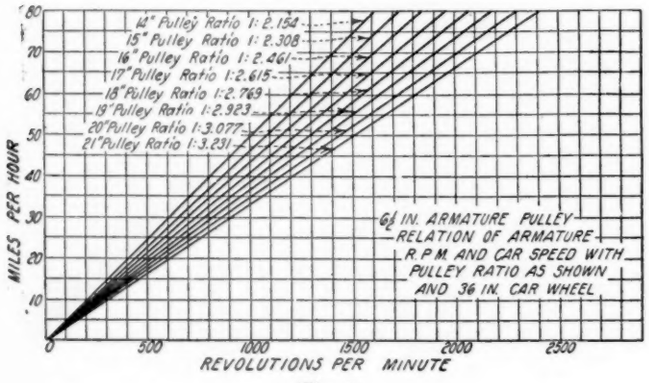


Fig 8

narily the distance and therefore the time interval between stops, was considerable, while the average rate of speed was comparatively high. Under these circumstances a minimum full load speed of approximately 25 miles per hour was low enough to give satisfactory operation.

However, a point has lately been reached in equipping passenger cars with electric light that makes it necessary to consider the conditions which obtain when the cars to be lighted are operated in branch line or local service.

The operating conditions that are generally characteristic of branch line and local service are:

(a). A less distance between stops than is generally encountered on main lines, and therefore a less time interval between stops.

(b). A lower schedule speed, both average and maximum.

(c). A less total distance to traverse in a day.

Therefore, the actual time that the axle generator is in operation per day is generally less in branch line and local service than it is in main line service, and the percentage of

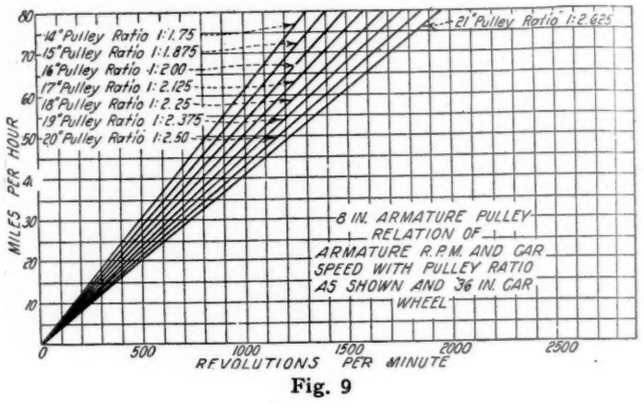


Fig. 9

the total elapsed time of the run that the train speed is above a given figure, is also less.

It is therefore apparent, that an axle generator which will maintain the lighting of a car in main line service, may give entirely unsatisfactory results when the car is operated in branch line or local service; but that a generator that will maintain the lighting in branch line and local service will also maintain the lighting in main line service. In other words, the generator with the low minimum full load speed will maintain the lighting in both classes of service.

As operating conditions may cause cars assigned to branch line or local service to be shifted to main line service and

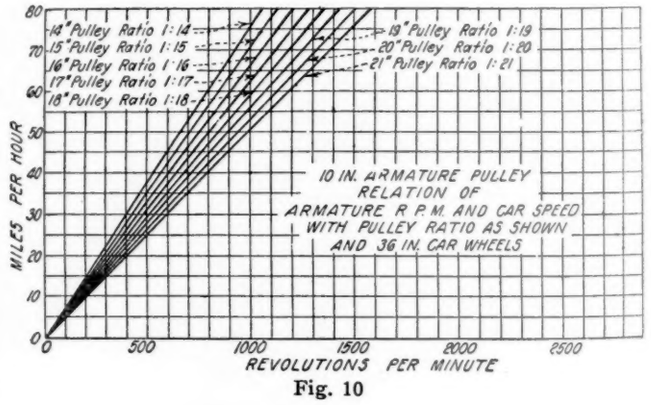


Fig. 10

vice-versa, it would seem desirable, from an operating point of view, to have all cars equipped with generators which will permit the car to be used wherever it may seem desirable.

If generators with a given minimum full load speed will not satisfactorily maintain the lighting of the car, there are only two remedies in so far as the axle generator is concerned:

(a). Decrease the minimum full load speed so as to have the generator in action a greater proportion of the time.

(b). Increase the net ampere capacity of the generator.

Both courses result in an increase in the total ampere hour output of the generator and both will entail a generator of larger physical dimensions.

It is a comparatively simple matter to take a series of speed time curves and from an inspection of them, determine a proper minimum full load speed, and then calculate the net ampere capacity required of the generator. It is a much more difficult problem to assume a new ampere capacity and determine the maximum possible value of the minimum full load speed.

Typical speed time curves of branch line operation are shown on Fig. 11.

The question is further discussed under the caption, "Net ampere capacity for axle generators."

Designation of Axle Generator Capacity

Heretofore it has been customary to refer to axle generators as having a certain kilowatt capacity. In view of the Association in 1919 having adopted as Recommended Practice that the rating of axle generators shall be expressed in amperes, it appears preferable to refer to them hereafter as having a certain "net current capacity."

Net Current Capacity of Axle Generators

In determining the minimum net current capacity of an axle generator that will be required to maintain successfully the electric service on a certain run, consideration must be given to several conditions.

The two factors which determine the minimum generator capacity are the amperes on battery discharge and the battery capacity, and these vary with:

(a). The size of the car, that is the number and voltage of the lamps, fans, etc., installed on the car.

(b). The amperes required to operate the lamps, fans, etc., when the maximum number in service at any one time is turned on.

(c). The magnitude and duration of the various discharges of the battery and the time at which each occurs with respect to the full cycle of operation of the car.

(d). The speed time curve of the car for its full cycle of operation taking into consideration the question of the relation of the time at which current will be required with respect to this speed time curve.

(e). Having decided upon the voltage of the battery, a study of conditions (a), (b) and (c) will determine the ampere hour capacity of the battery to be used; and the capacity determines the normal rate of charge and discharge of the battery.

(f). Conditions (c), (d) and (e) must then be studied to determine the net ampere capacity of the axle generator.

To do this a minimum full load speed must first be assumed. Then the generator while running at this or higher speeds must furnish all current required by the lamps, fans, etc., and in addition it must replace in the battery the ampere hours consumed when the speed is less than the assumed minimum speed plus additional ampere hours sufficient to compensate for the ampere hour efficiency or inherent losses of the battery.

Of course, the higher the minimum full load speed is assumed, the greater the net current capacity of the generator must be; as in the same cycle of operation of the car, it is in action a lesser time, while the ampere hour requirements may be and generally are, increased.

From the above it will be seen that to cover the entire field, i. e., all classes of cars, kinds of service and character of runs, the calculated minimum net ampere capacity would probably vary with each possible combination.

It should also be noted that, while a higher minimum full load speed in miles per hour, entails a larger output in ampere hours, and ordinarily would require a generator of larger capacity, this is not necessarily so, and in fact the reverse may be the case.

The reason for this is, that as yet, the question of the minimum armature r. p. m., at which the generator will carry the desired net amperes, has not been considered.

Minimum Armature Speed

The minimum armature speed depends upon:

(a). The minimum train speed at which the generator must carry the desired net amperes.

(b). The diameter of the car wheel.

(c). The relative diameter of the axle and armature pulley, i. e., the ratio of reduction.

When considering the minimum armature r. p. m. at which the net ampere capacity is to be generated and the ratio of reduction to be used, the question of the maximum armature r. p. m. must not be lost sight of, as otherwise, as high train speeds, the r. p. m. of the armature may be so great as to be dangerous.

Consideration of the above indicates that for any given case a great number of solutions is possible, and that, when all cases are considered the number of possible solutions of the minimum net ampere capacity is infinite.

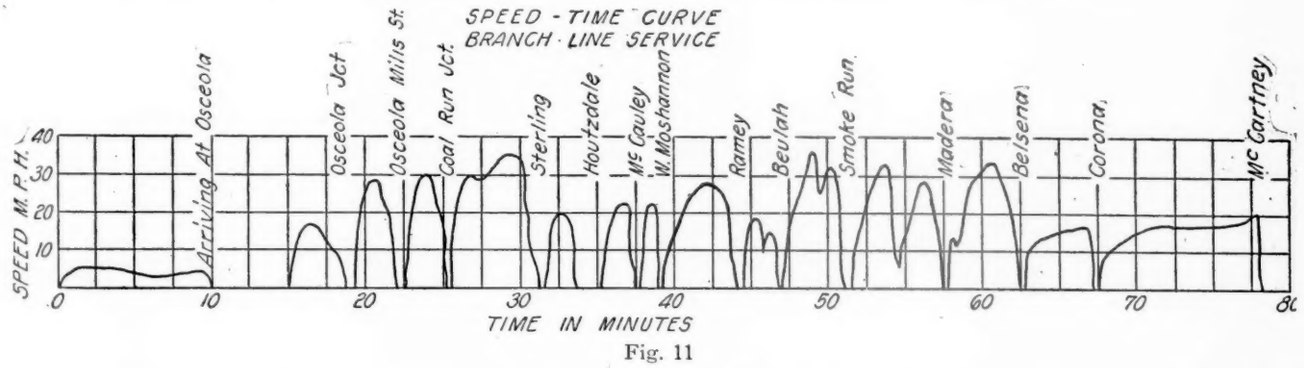


Fig. 11

When theory is reduced to practice, a number of factors, such as clearance, practical pulley ratios, belt strength, etc., operate to reduce greatly the number of practical solutions.

The committee considers that experience has demonstrated that the following combination will cover the entire field:

CLASS OF SERVICE	Approximate maximum load demand	Ampere hour capacity of battery Min.	Ampere hour capacity of battery Max.	Ampere capacity of generator	Minimum full load speed M. P. H.
Official, sleeping, parlor, mail and dining cars having heavy lighting loads, or severe operating conditions	50	350	600	100	26
Mail, dining cars, etc., where the lighting loads are not so heavy or the operating conditions so severe	35	300	350	75	26
Coaches, passenger baggage cars, baggage cars under average operating conditions	25	200	300	50	21
Same cars as next above operating in slow speed branch line or local service	25	150	225	50	16

It is, however, an open question as to how far to apply this table. The question should be determined by each railroad from a study of the conditions under which their cars

must operate; giving full consideration to the first cost of equipment; value of stock to be carried for repair, etc.

For instance, if the conditions on any road are such that the majority of cars require, for successful lighting, an axle generator having a minimum full load speed of, say 16 miles per hour, and conditions of operation are such that the cars are liable to be transferred from one class of service to another, it would seem desirable to make all generators of the one design, even though the first cost of some of the generators was greater than necessary. The advantage of no restrictions on the operating department in the manipulation of the cars and of having one type of generator and the decrease in the amount of repair parts to be carried in stock should outweigh the additional first cost.

On the other hand, if the cars are restricted to certain runs and if the requirements of the service indicate that a considerable number of cars requires generators having minimum full load speed of 21 miles per hour or both 21 and 26 miles per hour, it might be desirable to have generators of different minimum full load speed.

Main Generator Fuse Clips

It is desirable that the various pieces of apparatus that are mounted upon the generator regulator and lamp regulator panels may be removed and reapplied without it being necessary to remove the panel from its support.

The contracts of the generator main fuse in the armature circuit now shown on M. C. B. Sheet U-5, are one of the parts that it is necessary to renew. To comply with the above recommendation, the committee submits Fig. 12, showing a main fuse contact on which the clips can be removed without disturbing the panel.

Regulator Adjustments for Different Types of Battery

In former years the lead-acid-lead battery was used exclusively in car lighting service, but of late the nickel-alkali-iron battery is also used.

The charging characteristics of the two types of battery are radically different and it appears advisable that the generator regulator be so constructed that they may readily be adjusted to suit either type of battery.

Your committee in its 1919 report, recommended that the net ampere capacity of an axle generator be based upon a maximum observable rise in temperature of 70° and 110° C, instead of the corresponding figures of the American Institute of Electrical Engineers of 65° C and 105° C respectively.

This was done under a misapprehension of the true meaning of the A. I. E. E. figures and because a comparison of similar tests run on road and bench indicated that on the road the generator would operate at a temperature several degrees lower than on the bench.

This recommendation was sent to letter ballot and adopted as Recommended Practice. However, the recommendation has been severely criticized on the ground that it does not conform to A. I. E. E. practice.

On looking into the matter further, your committee feels that the criticism is well founded.

The A. I. E. E. standardization Rules specify that the *rating* of motors and generators shall be based upon a maximum observable rise in temperature of 65° C and a maximum observable temperature of 105° C when class "A" insulation is used, the rating taking no account of the conditions of service.

The A. I. E. E., however, recognizes, especially in the case of railway motors, which in their service conditions are more nearly comparable to an axle generator than any other class of motor, that there is a difference between the temperature at which a machine is rated and the temperature at which it may be allowed to operate.

Therefore, the committee has, in submitting these specifications, used the standard temperature values of the A. I. E. E., but would call attention to the fact that under similar conditions of test an axle generator will operate several degrees cooler on the road than on the bench.

Having discussed the various features that must be considered, your committee herewith presents the following specifications for axle generators:

Specification for Axle Generators

1. *General*—(a) This specification is intended to cover axle generator equipment for the A. B. and C. Railroad, delivery to be made f. o. b. manufacturers' works.

(b) Submission of bid will be understood to imply that the manufacturer fully understands and accepts the requirements imposed by, and will furnish apparatus which will comply with this specification.

(c) These axle generators are intended for service on cars having a total load, lamps, fans, etc., of.....amperes at 32 volts. Each car will be equipped with.....cells of battery of.....ampere hours capacity.

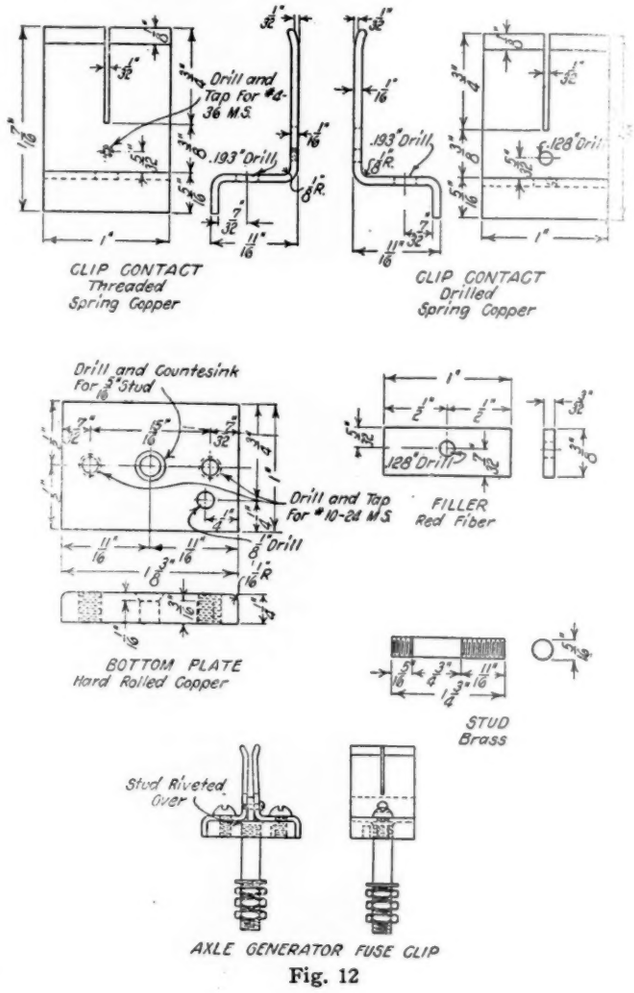


Fig. 12

Note.—The railroad company shall specify whether the lead-acid-lead or nickel-alkali-iron battery will be used.

(a) The generator shall carry full load at.....miles per hour. (For recommended values of minimum full load speeds, see below.)

CLASS OF SERVICE	Approximate maximum load demand	Ampere hour capacity of battery Min.	Ampere hour capacity of battery Max.	Ampere capacity of generator	Minimum full load speed M. P. H.
Official, sleeping, parlor, mail and dining cars having heavy lighting loads, or severe operating conditions	50	350	600	100	26
Mail, dining cars, etc., where the lighting loads are not so heavy or the operating conditions so severe	35	300	350	75	26
Coaches, passenger-baggage cars, baggage cars under average operating conditions	25	200	300	50	21
Same cars as next above operating in slow speed branch line or local service	25	150	225	50	16

(e) The material and workmanship shall be the best of their respective kinds.

(f) The accredited representative of the A. B. and C. Railroad shall be the sole judge, on all questions that are not capable of measurement and record, as to whether or not the apparatus complies with the specification.

(g) The apparatus to be furnished shall consist of:

Axle Generator,
Axle Generator Pulley,
Generator Leads,
Generator Lead Terminal Block (to be mounted on car body),
Generator Suspension,
Generator Regulator (with corner brackets),
Lamp Voltage Regulator (with corner brackets),
Axle Pulley,
Axle Pulley Bushing,
Belt and Fasteners,
Lamp Circuit Distributing Panel.

Note.—Any item not desired shall be crossed out.

2. *Axle Generator*—(a) The axle generator suspension lugs shall be of such design and cross section as to eliminate, as far as possible, liability to blow holes, bubbles or other manufacturing defects which may tend to weaken the material in the lug or section of frame adjacent to the lug.

The holes in the lug shall not be cored. The design and location of the lug shall be aproved by the railroad company. Where there is movement of suspension links or pins in the lugs, the hole in the lugs shall be suitably bushed, the bushing being placed in the lug in such manner that it cannot be lost or move relative to the lug.

(b) The generator frame, pole pieces and end housings shall be machined so that all are in accurate alignment and interchangeable from one generator to another of the same make, size and type.

(c) The end housings shall be machined for the ball bearings with allowance for fit as given below:

HOUSING FITS

Bearing No.	Outside diameter, in. Nominal	Maximum	Minimum	Allowance, in. Maximum	Minimum
304	2.0473	2.0473	2.0465	+.0026	+.0008
307	3.1496	3.1496	3.1488	+.0026	+.0008
308	3.5433	3.5433	3.5425	+.0026	+.0008
312	5.1181	5.1181	5.1173	+.0030	+.0012
407	3.9370	3.9370	3.9362	+.0030	+.0012
409	4.7244	4.7244	4.7236	+.0033	+.0015
412	5.9055	5.9055	5.9043	+.0037	+.0015

Above allowances are based on a total tolerance of 0.0010 in. for housing bore.

(e) The armature shaft at the fits for the inner race of the ball bearings will preferably be ground to the diameter with allowable tolerances as given below for the size of ball bearing to be used.

SHAFT FITS

Bearing No.	Bore Nom.	Max.	Pressed fit allowance, in. Min.	Max.	Min.	Desired.	Sliding fit allowance, in. Max.	Min.
304	0.7874	0.7876	0.7870	+.0011	+.0001	+.0003	—.0001	—.0011
307	1.3780	1.3782	1.3776	+.0012	+.0002	+.0005	—.0001	—.0011
308	1.5748	1.5750	1.5744	+.0012	+.0002	+.0005	—.0001	—.0011
312	2.3622	2.3624	2.3617	+.0015	+.0004	+.0007	—.0001	—.0012
407	1.3780	1.3782	1.3776	+.0013	+.0003	+.0006	—.0001	—.0011
409	1.7717	1.7719	1.7713	+.0014	+.0004	+.0007	—.0001	—.0011
412	2.3622	2.3624	2.3617	+.0017	+.0006	+.0010	—.0001	—.0012

Above allowances are based on a total tolerance of 0.0004 in. for shaft diameter at fit.

Should the bearing be mounted on the shaft by means of an expansion device instead of a press or sliding fit, this expansion device shall be so constructed as to relatively secure the bearing to the shaft and to lock positively under any and all service conditions.

(f) The armature shaft for all axle generators at the pulley fit shall conform to the dimensions shown on M. C. B. Sheet U-7.

(g) The armature shaft pulley nut shall be of the..... locking nut type. The face of the nut adjacent to the hub of the pulley shall be finished square with the axis of the thread.

(h) The armature, as a whole, shall be designed as a unit to permit the ready renewal of the shaft without disturbing any part of the winding.

(i) The commutator bars shall be hard-drawn, drop forged or cast-swedged copper with solid risers. The insulation between bars shall be high grade mica of such design and quality as will wear at the same rate as the bars. The commutator bars shall be insulated from the shell by built-up forms of high grade mica.

The commutator shall be thoroughly seasoned and securely fastened on the shell.

The armature conductors shall be of copper, insulated, preferably with American Institute of Electrical Engineers Class "B" insulation.

(l) The end housing shall have one or more circuar U-shaped grooves machined in the bore through which the shaft passes; and felt washers, fitting the shaft snugly, shall be applied to the inner side of the commutator end housing and to both sides of the pulley end housing.

(m) The field coils shall be wound with copper, insulated,

(j) Bearings shall be of the annular ball type and of the size specified as follows:

Truck Suspended		BODY SUSPENDED Width of belt required to transmit necessary power Free speed				Controlled speeed					
		5 in.		4 in.		3 in.		4 in.		3 in.	
Pulley	Comm.	Pulley	Comm.	Pulley	Comm.	Pulley	Comm.	Pulley	Comm.	Pulley	Comm.
412	412	412	*412	409	*409	407	407	312	312	307	307
...	...	...	‡409	...	‡407	...	...	...	‡308	...	‡304

*Preferred. ‡Alternate.

Bearings shall conform to the following dimensions with the allowance and tolerance as given: (S. A. E. Standard).

Bearing No.	Inside diameter inches Nom.	Max.	Min.	Outside diameter inches Nom.	Max.	Min.	width inches Nom.	Max.	Min.	Eccentricity tolerance's inches Inner	Outer
304	0.7874	0.7876	0.7870	2.0473	2.0473	2.0465	0.5906	0.5906	0.5856	0.0006	0.0012
307	1.3780	1.3782	1.3776	3.1496	3.1496	3.1488	0.8268	0.8268	0.8218	0.0008	0.0012
308	1.5748	1.5750	1.5744	3.5433	3.5433	3.5425	0.9055	0.9055	0.9005	0.0008	0.0012
312	2.3622	2.3624	2.3617	5.1181	5.1181	5.1173	1.2205	1.2205	1.2155	0.0010	0.0016
407	1.3780	1,3782	1.3776	3.9370	3.9370	3.9362	0.9843	0.9843	0.9793	0.0008	0.0012
409	1.7717	1.7719	1.7713	4.7244	4.7244	4.7236	1.1417	1.1417	1.1367	0.0010	0.0016
412	2.3622	2.3624	2.3617	5.9055	5.9055	5.9043	1.3780	1.3780	1.3730	0.0010	0.0016

(k) One end bearing shall be mounted so that the bearing shall have approximately 0.01 in. play is the longitudinal direction of the shaft. The other end sall be mounted so that it shall have at least ⅛ in. play in the longitudinal direction of the shaft.

(d) The armature shaft shall be annealed carbon steel having characteristics equal to or better than the following:

Carbon .....0.38 to 0.52 per cent
Manganese .....0.40 to 0.75 per cent
Phosphorus (not more than) ..... 0.05 per cent
Sulphur (not more than)..... 0.05 per cent
Tensile strength, lbs. per sq. in. (not less than).....80,000
Yield point, lbs. per sq. in. (not less than)....0.5 tensile strength
Elongation in 2 in., per cent inverse ratio, 1,800,000 ÷ tensile strength
Elongation in 2 in. (not less than).....20 per cent
Reduction in area (not less than).....32 per cent
Reduction in area, per cent inverse ratio, 2,800,000 ÷ tensile strength

NOTE.—See specification of the Railway Master Mechanics Association for annealed carbon steel, Vol. L, 1917-1918, page 254.

preferably with the Class "B" insulation of the American Institute of Electrical Engineers.

The field coils shall be form wound, impregnated with a suitable insulating compound to conform to established practices of electrical manufacturers, or thoroughly saturated by the dipping process with insulating material and then baked. The coils shall be covered with at least two layers of insulating tape laid with a half lap. The ends of each coil shall be marked to indicate the inner and outer ends of the coil. The coil shall be placed over the pole pieces and so held as to prevent positively any relative movement of the coil with respect to the pole piece.

(n) The pole changer shall be of such design as to throw com-

pletely, from one position to the other, in not more than ten revolutions of the armature shaft.

(o) The armature pulley shall be———in. in diameter in accordance with A. R. A. Drawing No. ..... and is intended to be driven by a ....in. .....ply belt from an axle pulley ....in. in diameter.

(p) Main generator and field leads shall be not less than 40 in. long and shall consist of No. 4 A. W. G. cable of not less than 61 strands, 5/64 in. wall of 30 per cent Para rubber insulation, or equivalent, covered with two braids.

(q) The generator shall be designed to generate rated voltage (40 volts) at load side of generator regulator and to carry full load, ...amperes (net current capacity, that is, total generated, less all field, control and regulating current used in the generator regulator and lamp voltage regulator), at an armature speed not to exceed.....r. p. m.

$$\frac{560}{60} \times \frac{\text{Diam. Axle Pulley} \times \text{Min. full load speed of car in miles per hour}}{\text{Diam. Armature Pulley}} = \text{r. p. m. of armature shaft.}$$

This value shall be known as the "minimum full load speed" in r. p. m. of the generator. (For recommended values in miles per hour see table in Section 1-d.)

(r) The generator, with an armature r. p. m. of not more than 75 per cent of the above speed, shall generate sufficient voltage and current to close the automatic switch at the voltage setting as given for same, this speed being known as the "cutting in speed" in r. p. m.

(s) The generator shall be safe to operate both electrically and mechanically at an armature r. p. m. of

$$\frac{560}{36} \times \frac{36}{33} \times \frac{\text{Diam. Axle Pulley} \times 75 \times \text{Factor of Safety } 1.2}{\text{Diam. Armature Pulley}} = \text{Max. Armature r. p. m.}$$

This value shall be known as the "maximum speed" in r. p. m. of the generator.

(t) At all speeds from cutting in to maximum speed, and at all loads from zero to full rated ampere capacity, the generator shall operate without destructive or excessive sparking at the brushes, and the armature and armature pulley shall rotate in good mechanical balance.

(u) The generator shall be capable of delivering rated net amperes within a range of 37 to 48 volts. (This requirement is not intended to conflict with the heat test.)

3. *Suspension.*—(a) The generators shall be ..... suspended. (The Railroad Company shall insert "truck" or "body.")

(b) The suspension shall be in accordance with the following drawings of the A. B. and C. Railroad, which are hereby made a part of this specification, or they may be in accordance with the manufacturers' standard if the railroad company so elect. (List drawings or cross out section applying to same.)

4. *Belt Tension Device.*—(a) The belt tension device shall be in accordance with the following drawings of the A. B. and C. Railroad, which are hereby made a part of this specification, or they may be in accordance with the manufacturers' standard if the railroad company so elect. (List drawing or cross out section applying to same.)

5. *Generator Regulator.*—(a) The generator regulator panel shall be composed of a non-conducting, non-combustible material having a horizontal dimension of 16 in. and a thickness of at least ¾ in.

(b) The panel shall have four holes drilled in same for the supporting bolts. These holes shall be 7/16 in. in diameter and located 1 in. from the sides and 1 in. from the ends of the panel, giving a horizontal distance, center to center of these holes, of 14 in. (Should it be desired to use a corner bracket with the panel, same shall have the supporting bolt holes drilled 7/16 in. in diameter and so located that when mounted on the panel the horizontal distance between center of holes is 14 in. For attachment to the panel the corner bracket shall be drilled and tapped for a ⅜-in. bolt having 16 threads per in.)

(c) The terminals on the generator regulator panel shall be arranged so that, in a horizontal direction, the positive is at the right and in a vertical direction the positive is at the top.

(d) Each terminal shall be stamped for identification and polarity.

(e) There shall be included with the generator regulator panel, wire terminals for attachment of the wires to the panel terminals; these wire terminals being stamped to correspond to the panel terminals to which they are to be connected.

(f) The apparatus will, preferably, be so mounted on the panel that it may be removed and reapplied without it being necessary to remove the panel from its supports.

(g) The connections between the various pieces of apparatus on the panel shall be, so far as is possible, on the back of the panel and preferably soldered after final adjustment has been made.

(h) The panel shall be supported by four ⅜-in. bolts having 16 threads per inch.

(i) Fuses, fuse contracts and fuse terminals shall conform to A. R. A. Drawing No.....

(j) The generator regulator automatic switch shall be set to close at any and all operating temperatures at not more than 34 volts, this voltage being attained by the generator at not more than 75 per cent of minimum full load speed.

(k) The automatic switch must open and close without chattering, pumping, sticking or excessive arching.

(l) The generator regulating apparatus and battery protective devices shall be of such design as to satisfactorily perform all the following functions:

1. Close the main circuit of the generator, by means of an automatic switch, in order to permit current to flow from the generator to the battery and lamps whenever the generator develops proper voltage.

2. Open the main circuit of the generator, by means of an automatic switch, in order to prevent the discharge of the battery through the generator when the r. p. m. of the armature has decreased to a point where its voltage is less than the battery voltage.

3. Automatically prevent the overloading of the generator.

4. Automatically control the rate of charge of the battery.

5. Automatically prevent overcharging the battery either in amperes or ampere hours.

6. In case of open battery circuit the generator shall continue to carry the lamp load and the generator regulator shall automatically prevent an excessive rise of voltage on the equipment.

7. Means will preferably be provided whereby the adjustment of the regulator can readily be changed from the voltage and current suitable for a lead-acid-lead battery to the voltage and current suitable for a nickel-alkali-iron battery of the same ampere hour capacity, the voltage being capable of being varied independently in the latter case from 1.72 to 1.8 to 1.88 per cell to take care of temperature conditions.

8. For any given condition of battery with any variations of speed at and above 150 per cent of minimum full load speed the regulator shall maintain regulation within 5 per cent, plus or minus, of the value for which the regulator is set for operation. This value to apply equally whether the type of regulation is potential, current, watts or any combination of same.

9. When submitting proposition, the axle generator manufacturers shall describe in detail the type of control of generator output and battery charging that they propose to furnish, submitting such curves as are necessary to afford a complete explanation.

NOTE.—Railroads may substitute for section 5-l detailed specifications covering such type or types of regulation that they desire to consider, provided that the limits are not greater than those given in this specification.

6. *Lamp Regulator*—(a) The lamp regulator panel shall be composed of a non-conducting, non-combustible material having a horizontal over-all dimension of 16 in. and a thickness of at least ¾ in.

(b) This panel shall have four holes drilled in same for the supporting bolts. These holes shall be 7/16 in. in diameter and located 1 in. from the sides and 1 in. from the ends, giving a horizontal distance, center to center of these holes, of 14 in. (Should it be desired to use corner brackets with the panels, same shall conform to the requirements as given under "Generator Regulator.")

(c) The terminals on the panels shall be so arranged that, in a horizontal direction, the positive is at the right, and in a vertical direction the positive is at the top.

(d) Each terminal shall be stamped for identification and polarity.

(e) There shall be included with the lamp regulator panel, wire terminals for attachment of the wires to the panel terminals, these wire terminals being stamped to correspond to the panel terminals to which they are to be connected.

(f) All apparatus will preferably be so mounted on the panel that it may be removed and reapplied without it being necessary to remove the panel from its supports.

(g) The connections between the various pieces of apparatus on the panel shall be, so far as is possible, on the back of the panel, and preferably, soldered after final adjustment has been made.

(h) The panel shall be supported by four ⅜-in. bolts having 16 threads per inch.

(i) The lamp regulator shall be so designed that with the complete equipment operating in the normal manner, on bench test or in service, it will maintain the voltage across the lamp mains on the load side of the regulator under the conditions of test as specified below, within the following limits:

1. With the battery discharging and with the battery voltage 31 volts or less, the drop in voltage across the lamp regulator resistance shall not exceed one volt with 40 amperes flowing.

2. With armature r. p. m. increasing at an approximately uniform rate from minimum full load speed to maximum speed in not more than five minutes and again decreasing to its original value, the voltage shall be maintained at.....volts, plus or minus one volt at any current value not exceeding 40 amperes.

3. With the armature r. p. m. held constant at any given speed between the limits of minimum full load speed and maximum speed, and with the current instantaneously varied by 5 ampere steps, both increasing and decreasing, the voltage shall be maintained at.....volts plus or minus one volt.

4. Conditions 2 and 3 shall be complied with under any condition of charge of battery.

NOTE.—Insert value at which it is desired voltage shall be maintained.

7. *Net Ampere Capacity*—(a) The generator shall have a net ampere capacity of.....amperes. (Net ampere capacity equals total current generated less all current used by fields, control, generator regulator and lamp regulator. For recommended values see Section 1-d.)

8. *Heat Test*—(a) Connect the generator, generator regulator and lamp regulator (if used) in the normal manner, using rheostat or lamp bank in the battery and lamp circuits.

(b) Remove hand hole covers and operate generator continuously for five hours at the armature r. p. m. corresponding to minimum full load speed with the generator delivering continuously .....net amperes at 40 volts.

(c) Under the above conditions, and with temperatures measured by the thermometer method, no part shall at any time attain a temperature higher than the values given below:

PART OF APPARATUS	Insulation A. I. E. E. Classification Class "A" Maximum observable temperature degrees C.	Class "A" Maximum observable rise in temperature degrees C.	Class "B" Maximum observable temperature degrees C.	Class "B" Maximum observable rise in temperature degrees C.
Any part of generator regulator, except resistance units, carbon piles, commutator, brushes, brush rigging and bare copper solenoids	105	65	125	85
Commutator, brushes, brush rigging and bare copper solenoids	125	85	125	85

(d) Bearings.—Maximum observable temperature 65° C.

(e) The net ampere capacity shall be determined by the maximum net amperes that can be generated without the above temperatures being exceeded.

9. *Insulation Test*—(a) Immediately after the heat test all parts of the equipment shall withstand, without breakdown, an alternating potential of 1000 volts, applied between conductors and ground, for a period of one minute, all metallic parts except conductors being grounded.

10. *Badge Plate*—(a) Each generator shall have attached to it a badge plate on which the following information shall be shown:

1. Manufacturer's name.
2. Manufacturer's type and serial number.
3. Nominal voltage.
4. Rating in amperes.
5. Minimum full load speed in r. p. m.
6. Pulley ratio. (Example, 2 to 1.)

11. *Rejection*—The A. B. & C. Railroad reserves the right to reject:

(a) Any equipment, or part thereof, that fails to comply with the requirements of the specification when inspected at time of delivery.

(b) Any equipment, or part thereof, that is defective in any way (material, workmanship or details of design) which might reasonably have been overlooked when approving the plans.

(c) Any equipment, or part thereof, that is responsible for an excessive number of failures in service, or that is found to be defective in material or workmanship within one year of date of delivery.

12. *Patents*—(a) The manufacturer shall insure the A. B. & C. Railroad against any and every loss arising from claim that the apparatus, as furnished, infringes patents not owned or controlled by the manufacturer and shall furnish the A. B. & C. Railroad, when requested, a satisfactory bond to cover such contingency.

13. *Guarantee*—(a) The manufacturer shall correct, without charge to the A. B. & C. Railroad, any defect due to design, material or workmanship which develops within one year from date of delivery of the equipment.

14. *Data*—(a) Dimension drawings in as full detail as may be necessary to afford thorough understanding of the equipment offered shall be submitted to and approved by the A. B. & C. Railroad before manufacture is begun.

15. *Shipment*—(a) No equipment shall be shipped until same has been accepted by the A. B. & C. Railroad or inspection waived and shipment authorized.

NOTE.—The railroad company when requesting bids shall fill in all blanks indicated thus.....

The committee would then recommend as follows:

(a) That the report be received as submitted.

(b) That the 4½ in. and 5½ in. pulleys shown on drawings Nos. 1 and 2, be substituted for the 5½ in. pulley shown on M. C. B. Sheet U-7. (See pages 6 and 7.)

(c) That the 5½ in., 6½ in., 8 in. and 10 in. pulleys shown on Drawings Nos. 3 to 6, inclusive, be substituted for the pulley shown in the upper left hand corner of M. C. B. Sheet U-7. (See pages 8, 9, 10 and 11.)

(d) That the castellated nuts and cotter keys shown on M. C. B. Sheet U-7 be eliminated, and that locking nut of a type acceptable to the purchaser be used.

(e) That the main fuse clips shown on Drawing No. 16 be substituted for the corresponding clip shown on M. C. B. Sheet U-5. (See page 26.)

(f) That the temperature for rating as established by the Standardization Rules of the A. I E. E. be substituted for the temperatures given in the 1919 committee report.

(g) That each of the above recommendations and the specification in its entirety be individually submitted to letter ballot as Recommended Practice.

The committee feels that with the adoption of the report they have covered the work assigned to the committee, in so far as they can now see, but would further recommend that the committee be continued with instructions to watch the developments of train lighting practice and report such features as may appear interesting or such as may necessitate a revision of present recommended or standard practices.

The report is signed by J. R. Sloane (Chairman), Pennsylvania System; C. H. Quinn, Norfolk & Western; E. W. Jansen, Illinois Central; E. Wanamaker, Chicago, Rock Island & Pacific; A. McGary, New York Central; L. S. Billau, Baltimore & Ohio, and A. J. Farrelly, Chicago & North Western.

Discussion

A motion that the report be accepted and referred to letter ballot was made and carried.

Report of the Committee on Subjects

THE COMMITTEE HAS CAREFULLY REVIEWED the replies received to Circular No. S III-102, requesting suggestions for subjects to be investigated by the committees during the year ending June, 1921, and has made recommendation to the general committee for their assignment to standing or special committees.

The report was signed by C. F. Giles (Chairman), Louisville & Nashville; C. E. Fuller, Union Pacific; T. H. Goodnow, Chicago & North Western; F. W. Brazier, New York Central, and H. R. Warnock, Chicago, Milwaukee & St. Paul.

Discussion

After presenting the report Mr. Giles said: We have not received any additional subjects or suggestions in accordance with the extract from Section 10-A of the Rules of the order of the American Railroad Association, but if any members have any subjects that they would like to have considered that have not already been suggested in their replies to the circulars referred, we will be very glad to receive them through the secretary within the next 30 days, because we expect to have a meeting of the Committee on Subjects and the Committee on Committees, and will get the work started as promptly as possible, because unquestionably we are going to have a big year's work before us.

A motion that the report be received and the recommendations adopted was made and carried.

Chairman Tollerton: We have now reached the end of the papers for discussion and we will in a very few minutes adjourn the Second Annual Convention of Section III, Mechanical, of the American Railway Association.

I want to take this opportunity as chairman of that section to express the honor and pleasure that I have felt in presiding over this body. The attendance has been very large; the enthusiasm has been great, and I want to thank the chairmen of the committees and all of the members for their aid and assistance to the chairman in making the convention the success it has been.

In adjourning the meeting, I want to express to all of you, members and families, my best wishes for good health, long life and good luck. The convention will again convene on this pier one year hence; the date has already been agreed upon, which is from June 15th to June 22d. In saying good-bye I want to wish you all a safe and pleasant journey home (applause).

Convention adjourned.

Date of Next Convention

THE CONVENTION of Section III, Mechanical, will be held at Atlantic City next year, June 15-22.

G. F. Hess Goes to Wabash

G. F. HESS, superintendent of machinery of the Kansas City Southern, has been appointed superintendent of motive power of the Wabash at Decatur, Ill., succeeding E. F. Needham, who has retired on account of ill health.

Final Registration Figures

AT THE CLOSE of the convention the Enrollment Committee announced the total official attendance at the meetings as follows:

Members, Section III	875
Members, Section VI	475
Special Guests	838
Railroad Ladies	832
Supply Ladies	678
Supply Men	2,575
Total	6,273

Chairman Pearce on the Conventions

JUST BEFORE Chairman Pearce of Section VI left yesterday he stopped in at the *Daily* office and made this statement. "We have surely been royally welcomed at Atlantic City and greatly appreciate the co-operation which we received from Section III. Section VI, which absorbed the activities of the Railway Storekeeper's Association, had its foundation and success as a thorough going, practical, capable organization because of the vision and foresight of J. P. Murphy, the secretary, who founded the association 15 years ago."

Mr. Pearce said that in his opinion the results had amply vindicated the decision of the Purchases and Stores Section to meet in Atlantic City at the time that the Mechanical Section was meeting here and the exhibit was being given. He praised the exhibit in the highest terms, and said that the purchases and stores officers had derived great benefit from them. He expressed the opinion that future conventions of the Purchases and Stores Section should be held in Atlantic City, but that only morning sessions should be held in order that the members should have ample opportunity to see the exhibits. He criticised the meeting hall in which the Purchases and Stores convention is held, and said that in future he would favor having its sessions somewhere off the pier.

The *Daily* must modestly admit that Mr. Pearce was also warm in his commendations of the reports given in its columns of the meetings of the Purchases and Stores Section.

P. and S. Report on Standards

ON TUESDAY AFTERNOON F. D. Reed, vice-President of the C. R. I. & P and chairman of the committee on standards, Section VI, submitted the following report:

There have been no subjects referred to this committee for consideration with the exception of the question of establishing a standard shipping tag for freight shipments, as suggested by Secretary Quigg, of Section IV—Traffic—and the question of revision of specifications for lumber, shown in the 1918 proceedings of the Master Car Builders' Association and the American Railway Master Mechanics' Association proceedings, which Section VI requested be revised. The question of standard specification for shipping tags was handled and recommendations forwarded to the chairman.

The question of revision of the specifications for lumber as recommended by Mechanical Section III will entail a large amount of detail work, and this is now being gone over by the various lumber associations with a view of securing their recommendations in connection with having our specifications conform as closely as possible to commercial practices, which will entail considerable time. It will be impossible to complete the report on this until later in the year.

The present specifications are fairly complete, but in a great many instances they conflict with commercial practices, and it requires special cutting to furnish lumber to these specifications, which entails higher costs than would be necessary if commercial sizes and grades were used. This whole feature will be covered before final report is submitted.

The action which was taken on this report was recorded in the June 16 Daily, page 1873.

American Railroad Association, Section VI, Purchases and Stores

Closing Session of a Most Successful Convention Devoted Largely to Association Business

The meeting was called to order by Chairman Pearce at 9.30 A. M. Wednesday morning.

Committee on Memorials

The committee on Memorials, Section VI, Purchases and Stores, American Railroad Association, submitted resolutions of sympathy and an expression of the loss felt by the association through the death during the year of the following members: W. F. Lamb, Southern; E. Chamberlain, N. Y. C. Lines; R. F. Schwaner, Sou. Pac.; C. J. Norman, Southern; W. R. Shoop, B. R. & P. These resolutions were signed by J. H. Waterman, I. H. Lance, W. F. Stokes.

A motion that these resolutions be adopted was carried.

Election of Officers

The nominating committee reported as follows: Officers for the ensuing year: Chairman, H. C. Pearce; Vice-Chairman, H. E. Gray. On the General Committee, members for two years, E. N. Bender, F. A. Bushnell, J. P. Murphy, H. H. Laughton, W. G. Phelps, J. G. Stuart, W. A. Summerhays. Members for one year: U K. Hall, W. A. Hopkins, D. K. Jellison, F. D. Reed, F. B. Wight, H. P. McQuilkin and E. J. McVeigh.

After the announcement by the nominating committee the following discussion ensued:

Mr. Pearce: Thinking over this matter carefully as I have, since the beginning of these meetings, it has occurred to me that it might be a good plan to revise our rules of order whereby the chairman and vice-chairman would be elected by letter ballot, giving all members of the Section, whether present or absent at these meetings, an opportunity to express their preference. The General Committee of this Section is the important, fundamental, governing party and should, of course, be elected on the floor at these meetings.

A motion was carried that the Secretary cast one ballot for the members in favor of those who were nominated for the General Committee.

Address by Mr. Pearce

I take this occasion to express and record my heartfelt appreciation of the splendid cooperation that I received.

On my left is our vice-chairman, Mr. W. G. Phelps. I served with him at Washington as his subordinate, and no man ever had a better director or advisor, and no man has ever had a better and more useful assistant—always ready to do his duty, and capable beyond measure. It is with the greatest pleasure that I am able to express to you the close friendship that has existed between us since we became associated together.

I wish to express my appreciation of the cooperation of the general committee. No organization ever had a more loyal, capable, frank, open and able directing body than this section. I wish at this time to express my appreciation of their services, and the knowledge that most of them will continue to serve is a bright spot in my thoughts of the future administration of the affairs of the section. I also wish to express to the members and individuals that I have known for years their splendid cooperation and those to whom I am not so well known, the assistance they have been to me in carrying on a meeting which had some parts wherein it could not be carried on as we would have liked to have done it. The time was rather short to accomplish all we had laid out.

We must realize the grave responsibilities which rest upon us at a very critical period in the formation of our organization and the operation of our railroads. We must co-ordinate our endeavors that we can command the respect and consideration of the owners and executives of the individual properties which we represent. It will be due almost entirely to the efforts of the subcommittees which do the work for your section during the year. These are the men that are the foundation of this organization. Their study, analysis and reports, based on practical knowledge of conditions, is the only thing which will enable us to accomplish our purpose, and the diligent work of these committees, if continued, will be the ultimate strength and perpetuation of this section.

Remarks by Mr. Roth

I regret greatly that it was impossible for me to be here during the time that you were considering the many important matters covered by your committee reports. While I am not at the present connected with the particular phase of railroading that I have been in the past and that you gentlemen are in now, I shall never lose my interest in the service of supply on the railroad. The responsibility resting on the officer in that department of the railroads is greater, and becoming greater each year than most of us have realized in the past. Through your association in the work of this Section the interchange of ideas—

things which you are able to recommend after study and consideration which you have given them—your value to the railroads is bound to greatly increase.

Nothing in my railroad experience has been so helpful to me, no other one thing will be so greatly responsible for any success which I may in the future achieve as my association with the Railway Storekeepers' Association, now Section VI of the American Railroad Association. The opportunity I had to associate at the meetings of that Association with men who knew from hard study and practical experience what must be done properly, is of inestimable value to me.

Address by Vice-Chairman Ray

Usually I much prefer to run the errands and carry the water and do the odd jobs that some of us have to do. In the old days when I went to school and we had dramatic performances, I was usually the dead body, and I rather fancy that sort of thing; but if the Association and officers have seen fit to make me vice-chairman I assure you I will do all in my power to make the Association what it should be, a representative gathering of storekeepers and purchasing agents, who will, I think, take their place with all the other associations, if we have not already done so.

Comment by Mr. Reed

I heard it mentioned before I came to this convention that there was a possibility of a number of the storekeepers on the different railroads feeling that the purchasing agents were going to control the affairs of this section, and that, I think, is what prompted our worthy president to be careful about taking the position for another year. I have heard it suggested, since I have been here, that the small attendance of storekeepers was probably due to that cause. Now, I want all of you to realize that this association was started by storekeepers, and it is going to continue to be of interest to storekeepers, just as much now as it ever was. We want all of the storekeepers to feel that they are just as interested in this part of the game as they ever were, and they are going to receive just as much consideration as they ever did, and we will expect them to do just as much work, if not more, than they ever did.

The purchasing agents are the spenders and the storekeepers are the savers. The savers are the fellows that are going to save the railroad, and the purchasing agents, if they did not have any storekeepers, would wreck them.

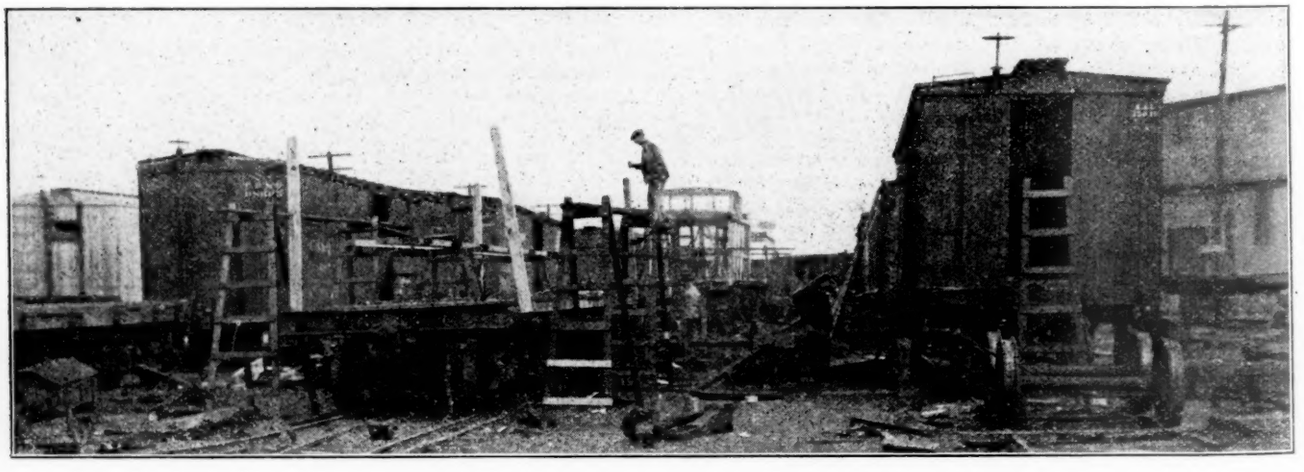
Remarks by Mr. Phelps

One of the greatest pleasures that I expect to get from this association is that I will get to know the storekeepers, district storekeepers, division storekeepers, and the general storekeepers, and I only wish the foremen and the other men were here so that we would know them all. I can learn from them, they are good fellows, and I want to know them all, and so far as the purchasing agents are concerned, they do not want to do all the work, they want the storekeepers to do it. If they want to do it all, personally, I am willing that they do it all. I say this, because I am a purchasing agent. While the general storekeeper did report to me, he does not do so now. That is, he does, but no one else knows it except the interested parties, and I report to him, too. The latch string of my office is out for any of them. I like to have them come in, no matter what their position is in the stores department. We are all railroad men, we are working for the best interests of the railroad, and we will have harmony and good feeling if we know each other better, and I hope if there are any that meet me hereafter that they will speak to me and tell me who they are. I have been up here on exhibition and maybe you have seen me and I have not seen you.

Mr. Waterman on J. P. Murphy

You do not know how much pleasure I personally get out of the convention. I think I know. I attended the first convention, and I want at this time to say something about our good friend Murphy. Murphy had a vision. Men that do things have visions. Murphy had a vision of the possibilities of the Railway Storekeepers' Association, and in that vision he saw before him the storekeepers of not only the United States but Canada, and he sent out messages to them. He gathered a little bunch in Chicago, and there originated what now is Section VI of the American Railway Association. He worked day and night, all the time, fearlessly, conscientiously and sometimes impulsively. And men, let this govern in our conventions in the future—forget the things in a man's life that are not pleasant and always think of the good. I think some time ago I gave this illustration:—I was out West, in South Dakota, and I saw a man down in a stream digging in the sand. He took a little pan and he put some dirt into the pan and stirred it around. He took a little more water in it, and he kept stirring it around, and at last I said, "What are you doing?" He said, "I am getting the gold out of the sand." Men, there is gold in every one of you, in every one of us, if you will just let the dross go and remember only the gold. I know the purchasing agent. I never had any better friends in my life than the purchasing agents and I never saw the time when I could not open the door and go in their office and they welcomed me. But why? Because I knew when to go out. There are lots of people here with whom we do not agree, but what is a convention for? Only to open up and express our opinions. I tell you young men of Section VI, this Section will do more to build you up and make you strong than any other one organization in the country, and I hope during the year you will do whatever work is assigned to you, and I believe you will, and work will be assigned to the young men. Storekeepers, get busy and do something.

The first annual meeting of Section VI—Purchases and Stores—was declared closed.



European Railway Observations

By Robert E. Thayer

European Editor, Railway Age

French Coal Shortage

Press despatches from the *London Times* give an idea of the coal situation in France to-day. It is said that the prospect for the oncoming winter is not encouraging. The output of the French mines for 1919 was a little less than 19,000,000 tons. France is to receive 9,000,000 tons from Great Britain, or 45 per cent of its export coal, and in addition is to receive coal from Germany under the peace treaty up to a total of 39,000,000 tons. The Germans, however, have not been living up to the treaty demands. With a yearly consumption of about 65,000,000 tons it will be seen that France must buy coal abroad in order to meet the demands. This imported coal will cost from 450 to 500 francs a ton, as against 75 francs a ton for the coal mined in France. The following figures show how the production of coal has decreased in France, regardless of the fact that the number of miners has increased:

Year	Number of miners	Coal produced, tons	Coal produced per miner
1913	203,000	41,000,000	202
1915	105,000	19,533,000	186
1919	157,374	19,000,000	122

Of course, it should be understood that there were less miners working in 1915 than in 1913, as there were fewer mines working, but the disquieting feature is that the production of the individual miner has decreased. The reduction per man is to some extent due to the fact that the hours of working have been reduced, only 6 hours and 17 minutes per day being now spent in the pit.

Automatic Couplers in Japan

As in all European countries, the question of automatic couplers is being considered in Japan. This nation includes a group of islands, and on all but one island nothing but the screw type of coupling is used, both for freight and passenger equipment. To the north, on the island of Hokkaido, both Sharon and Penn automatic couplers are used; the gage on these lines is 3 ft. 6 in. The couplers are similar in design to those used in the United States, but about three-quarters of the size. The lines in South Manchuria and Korea are equipped with the U. S. standard automatic coupler.

The question of gage is a very live one in Japan. The main island and the islands of Kyushu, Shikoku, Kokkaido, and Formosa all have the 3-ft. 6-in. gage, whereas South Manchuria and Korea have the standard 4 ft. 8½ in. gage. The island of Kyushu has extensive coal fields and at the present time the coal is carried from this island to the main island by train ferries. Plans have been developed, however, for constructing a tunnel, about 2 miles long, between these two islands. With this tunnel there would be a continuous line to Tokio, the industrial district of Japan. The distance between the coal fields and Tokio is some 800 miles, and with the standard gage the transportation of coal could be expedited and efficiency increased. None of the freight cars in Japan is equipped with brakes, but the standard passenger car brake uses the steam vacuum, similar to that used in England.

Further Wage Increases in England

At the same time that the Railway Wages Board of Great Britain awarded an increase in wages to the locomotive men, as reported in our June 11 issue, an increase was granted to the conciliation grades, made up of porters, trainmen and other men of the lower wage scales. The demands for these men were presented by the National Union of Railwaymen and the weekly increases vary from 2s. 6d. (60 cents) to 7s. 6d. ($1.90), which gives as a maximum increase (for the porters) of 197 per cent over the pre-war rate. This award was granted on demands for a 20s. weekly increase.

The Railway Wages Board, which has previously been mentioned, is made up of four representatives each of the railway companies, the railway men and the railway users, with a chairman appointed by the government. The award was signed by 12 of the 13 members of the committee and in presenting its report the board stated that unless additional revenue can be secured to meet this additional expenditure the awards will involve the companies in an actual net loss. It is stated that a further advance of 20 per cent on present-day rates for both passenger and freight traffic would be necessary to meet additional expenditure, apart from any concessions made by the Board. This would bring the 50 per cent advance on ordinary passenger rates and the 50 per cent average additional to freight rates up to 80 per cent over the pre-war rates. If the full claims of the railway men, as submitted to the Board, had been approved a further 20 per cent increase in both passenger and freight rates would be necessary, thus making both passenger and freight rates 110 per cent above the pre-war level.

The dissenting member of the board, Donald A. Matheson, general manager of the Caledonian Railway in Scotland, said that while the affairs of the country are of a transitory character there should be no alteration of any of the rates of wages fixed under recent agreements, with the exception of a few of the grades. He said there should be a realization, first, of the fact that the burdens recently put on the railways have already produced a breaking strain, and, second, of the fallacy connected with the charging of higher rates and fares for conveyance than the traffic can bear.

It is exceedingly interesting to note that all of the railwaymen's representatives approved of the rates granted, which were from 87½ per cent to 62½ per cent lower than that which was demanded. What the reaction will be amongst the men themselves remains to be seen. Undoubtedly there will be considerable denunciation amongst the extremist section as a matter of course. The new rates will give a total weekly wage as shown below:

	New rates	
	English money	U. S. equivalent
Porters, grade 1 (London and industrial areas)	67s. 6d.	$16.90
Porters (rural areas)	65s. 6d.	$16.38
Ticket collectors, class 1 (London and industrial areas)	74s.	$18.50
Ticket collectors (rural areas)	71s.	$17.75
Guards, first year	68s.	$17.00
Guards, sixth year	78s. 6d.	$19.63
Shunters, class 1	78s. 6d.	$19.63
Station foremen, class 1	79s. 6d.	$19.88
Traffic regulators	90s. 6d.	$22.63
Goods depot checkers (London)	74s. 6d.	$18.63
Goods depot checkers (rural districts)	67s. 6d.	$16.88
Head carters (London)	74s. 6d.	$18.63
Permanent way gangers (London termini)	81s. 6d.	$20.38

The Man Who Saw

Wash Your Boiler With Hot Water

"You're operating under difficult conditions," said the doctor in response to his client's eager questioning. "Your stomach is not functioning properly. Here's a tonic that will keep you well. I've used it on other patients with great success."

The roundhouse foreman nodded a weak assent. "Now," said the doctor, "you're under a strain—you're overworked—your pushing your generating capacity to the limit and I advise you not only to follow the directions on this bottle, but to drink hot water every morning. This will thoroughly wash out your stomach and tend to prevent the accumulation of secretions which do not belong there. Do it often, do it well—you'll soon notice the difference."

And as he took up his hat and medicine case to go, the railroad man wondered what doctors knew about locomotive boilers, anyway! He seemed to speak with a significant familiarity.

Fuller Pep Says He's Fuller Prunes

Fuller Pep's eyes sure had an amusing sparkle in them as he made his way toward the mail bag.

"I came in to thank you for your paragraph about K. K. introducing me," he said, extending his hand. "I hadn't thought about the number of exhibitors clamoring for write-ups and your interesting calculations put it before me very clearly—67,081 things to describe! When you come to think of it, it's ridiculous to try to favor any of them."

He turned to go, but hesitated. "Say," he said, thumbing the head of the cane with the Moorish design on it, "that feller Hum Dinger is fuller prunes. Tell him I said so, will you? Tell him I've got a plan that's right—that will suit both sides. I'll tell you about it next year, so long."

"So long," answered the Man, as he wondered what the gingery one had up his sleeve.

The Early Struggles of a Supply Man

"They had a hard time," said Lone Star, indicating a railroad supply booth over his shoulder, as the expression which accompanies the thought of a pleasant reminiscence spread over his face. "The outfit had a good thing," he continued, "but they didn't have enough money to swing it. It was a case of scratching gravel right along. The railroads wanted their product all right, but it was a job to get it out. Well, they were resourceful and won out; the little concern of that day is the million dollar one now.

"One of the firm conceived the brilliant idea of pulling off a pre-arranged collision and he bought two wheezy old eight-wheelers from his friend and patron, S. M. Okestack, S. M. P. of the High Dry & Windy Railroad. He then purchased a lot of old canvas from an itinerant circus and cut it up to serve as an eight-foot fence around the space he had laid out for the staging of the big show. The news of the coming excitement spread far and wide and the hurriedly improvised tickets sold like proverbial hot cakes at a dollar per.

"The big day finally arrived, the arena was packed and the two principals stood at respective extremes of the track outside of the enclosure with steam up and ready for the fray that would put them in the scrap pile where they were long overdue. The excitement was intense as the enthusiastic promoter admonished each engineer to 'tie down the whistle and open her wide up so they'd be sure to meet in the middle.'

"The blowing of the whistles proclaimed the start as the necks of thousands of sweating fans craned for advantage—and the fun began.

"But all they saw was a shrieking streak of No. 1 as it tore through the space in front of them and smashed into No. 2 in its place on the outside of the enclosure. It looked as if somebody had gummed the works, laughed Lone Star, No. 2's drivers were slipping wildly and she never budged an inch! The crowd on the outside enjoyed the party, wrote the hilarious reporter in the *Evening Taddle-Tale.*"

K. K. Introduces Fuller Pep

The Man Who Saw counts that day lost when Kronic Kicker fails to light up the scenery by the Mail Bag with his unconvincing smile. This time he brings in his old friend, Fuller Pep, a well and favorably known satellite of the railroad supply world on the pier to complain that we didn't give Mr. Pep a write-up this year.

Now, gentlemen, *please* be reasonable. There are 359 exhibits this year and in each booth there are 359 items of portentous importance to the railroad man. 359 x 359 = 67,081 things to write about.

It can't be done, gentlemen, with equal fairness to them all, but The Man Who Saw and his associates have between grinds for the relentless mill of The Editor, tried to at least look it over and pack away for future use the many lessons that they hold, and in this connection may he not remind you that it's news he wants and it's news he's paid for. Bring in the new; they're familiar with the unchanged old.

A Letter From Hinky Dee

In response to the hundreds of requests from the friends and followers of the celebrated car lighting expert, Mr. Hinky Dee, we publish the following letter, which, due to Hum Dinger's gumming of the Mail Bag's works, could not be published sooner:

WINDY, TEXAS, *June* 14, 1920.

Idiotur Mail Bag, care Man Who Seen, Atlantic City.

dear sir:

I am the chief electrishin here on the high dry & windy RR now. Don't publish nothin' about this here letter becorse my boss, mister S. M. Okestack, the S.M.P., would fire me for what I think en not fur what i am. i seen that there letter of his'n what he rote you an said the prune plan is a pancake. I'll say so. If they eat it they'll get the dandiest bellyake they ever had. all i got to say is that mister S. M. Okestack thinks moar of selling ther mane rod then he dus about this here job. If you realy want the strait doap, send fur me next year en doant wait to the last minit like you done this year.

Yors fur infernal progress of the railroad electrical department.

HINKEY DEE.

Lord Robert and the Man Went Fishing

There was a rumor being whispered merrily around the Pier yesterday to the effect that the missing page of the Man Who Saw in the issue of Wednesday, the 16th, is the result of a row. Some of them have gone so far as to assert that they have it on good authority that the Man sassed the Editor, who told him to go to—— and, furthermore, in the free-for-all that followed, Lord Robert, the Londoner whose page is also missing, seeing that his boss was being worsted and his pay check in

danger, jumped in in its behalf. The Man Who Saw hastens to deny these allegations and says that both he and Lord Robert decided to take a day off and trust that the friends will refute all rumors which contradict this statement.

The Man Who Saw is not only still on the job, but his readers will doubtless be delighted to hear that Lone Star has promised to drag a delegation of railroaders here next year that will fairly bust up the Man's column with excitement. Bring 'em along, L. S., we'll introduce them to nuts Hum Bug Dinger, Fuller Pep and Hinky Dee.

Goodbye, Old Friends!

The Man Who Saw acknowledges the Mail Bag's receipt of a letter, upon the closing of the great convention, wishing him well in the year that ensues. It bore the signatures of his friends and contributors, the Daddy of Motion, Lone Star, the College Man, Hum Bug Dinger, Kronic Kicker, S. M. Okestack, Beat M. Tooit, D. R. Ivingbox, Jim Skeevrs and the Editor.

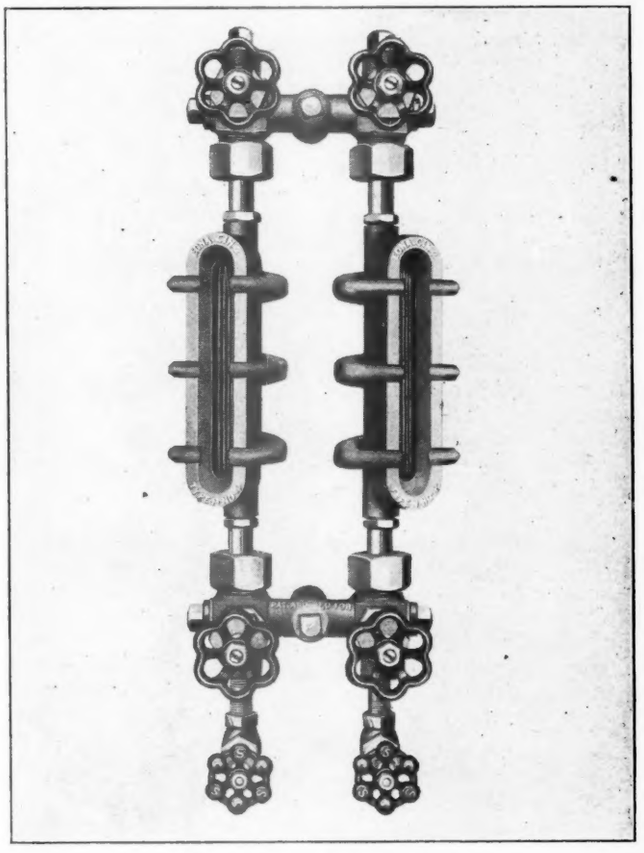
The Man thanks you all for this pleasant expression of your sentiments as well as for your splendid cooperation in his humble grind of grist from the seat by the Mail Bag. He especially thanks the Daddy of Motion for his example, Lone Star for his tales, the College Man for his lesson of hopefulness, Hum Dinger for his unparalleled exhibition of nerve, Kronic Kicker for his unfailing daily attentions and the Editor for his apparently unlimited patience. He regretfully bids you goodbye, good health and good luck in the name of all the friends in the country's biggest game and adds,

—"you came to look and learn and play,
he hopes you'll come another day."

When Papa Gets Home From the Convention

Edna Duplex Water Gage

THE EDNA BRASS MANUFACTURING COMPANY, Cincinnati, O., is exhibiting an entirely new water gage designated as type 1920-M, which has been designed to embrace the desirable features of the Edna type M reflex water gage and to comply with the government requirement that the water level can be checked from either side of the locomotive cab. As will be noted in the illustration of this gage it is in fact a duplex arrangement in which two reflex water gages are mounted on a parallel frame, each having the same boiler connection.



New Duplex Water Gage

One glass may therefore be set so as to face the engineman, while the other may be set at any angle convenient to the fireman. The use of two individual reflex glasses mounted so that either may be cut out in the event of breakage has the advantage of greater reliability over a gage having a single glass, and at the same time eliminates many of the difficulties involved in the construction of a gage with a single glass visible from either side of the cab.

In other respects the construction of this new gage does not differ materially from the type M gage in which no bolts or hinges are used. The body parts are held securely in place by a series of clamps which put the pressure directly on the packing gaskets, so that there will be no strains in the body lines which might tend to distort the packing surfaces. A further advantage found in the type M gages, including the 1920 type, is that the glass and gasket can be removed without disturbing the frame in the boiler mounting. High grade steam metal is used in the construction of these gages and the clamps are of non-corrosive bronze. The gages are made in several sizes with respect to gage stems and boiler fittings. They are all thoroughly tested and are guaranteed to stand 300-lb. boiler pressure.

Conventionalities

Frederick L. Sivyer, president of the Joliet Railway Supply Company, arrived yesterday and joined Mr. and Mrs. C. A. Carscadin and Mr. and Mrs. R. W. Burnett here. Mrs. Sivyer was here last year but is not coming this year.

Among those who arrived at the convention yesterday was H. T. Nowell, mechanical superintendent of the Central Vermont. Mr. Nowell reports that he was detained owing to the fact that one of his roundhouses burned down.

The exhibits are gradually assuming the proportions of a world's fair. George Wall, electrical foreman, car lighting department, arrived Saturday, intending to see everything in two days, but on Monday had to send a wire to headquarters saying it would take another day.

W. K. Dowe, general manager of the Cuban Air Reduction Corporation, was a visitor Tuesday and spent considerable time watching the working exhibits of the different welding concerns in their space beyond Convention Hall. The plant of the Cuban Air Reduction Corporation is the first of its kind to be established in Cuba for the production of oxygen for welding and cutting.

E. H. Hall, superintendent of the car department of the Chicago Great Western, seems to have missed his calling; at least those who have heard of his recent exploits agree that he would make an excellent movie star. On Monday Mr. Hall put out a fire on the roof of Young's pier and on Tuesday he stopped a runaway of a two-horse team, thereby probably averting serious injury to an automobile party.

Readville, Mass., is a suburb of Boston and headquarters of the stores department of the Eastern lines of the New Haven road, as well as the location of the largest shops on the system. B. C. Hart, division storekeeper for the New Haven at that point, arrived Tuesday evening. His comment on the Atlantic City conventions is to the effect that it is a step in the right direction for both the stores as well as the mechanical department.

Among the railway supply companies interested in foreign business is the Independent Pneumatic Tool Company of Chicago. This company is sending R. S. Cooper, its vice-president and general sales manager, to London shortly for the purpose of opening an European office. Mr. Cooper has been with this company for a number of years. It is interesting to note that there is an increasingly large number of American business concerns who believe in and see the possibilities of the European market.

At the morning session of Section III on Monday in connection with the report of the Committee on Autogenous Welding, Prof. A. S. Kinsey of Stevens Institute of Technology, Hoboken, N. J., emphasized the need of the training of oxy-acetylene welders. We learn that the professor has from time to time assisted a number of engineering plants in the organization of their welding departments, and that he has been retained by the Air Reduction Company, New York, to organize a corps of expert gas welders. These men are being sent over the country to give instruction in the making of safe welds of all the engineering metals. This will go far toward carrying out the recommendations of the prominent engineering societies, that something constructive be done to assure the making of good fusion welds.

Angello Conti, chief engineer of the Emergengy Fleet Corporation, visited the exhibit hall Sunday afternoon on an invitation of Harry B. Oatley of the Locomotive Superheater Company. Mr. Conti has been with the Emergency Fleet Corporation as its chief engineering officer since the outbreak of the war. He is well known in marine engineering circles and was instrumental in establishing the engineering construction details which have prevailed in the Emergency Fleet Corporation work. Mr. Conti was much impressed with the exhibit.

George S. Smardon, who is attending the conventions, and who represents the Anchor Packing Company of Philadelphia, is a recent recruit from the railroad to the railroad supply business. He was secretary to Cary R. Gray, now president of the Union Pacific, when Mr. Gray was president of the Western Maryland, and later when he was Director of Operations of the United States Railroad Administration. Previously Mr. Smardon was secretary to J. M. Fitzgerald when he was president of the Western Maryland. Before going to the Western Maryland, Mr. Smardon served on the Baltimore & Ohio and with the Pullman Company.

Chairman H. C. Pearce, of the Purchases and Stores section, was one of the most interested spectators during the movie of the Southern Pacific supply train yesterday afternoon, he being an old Southern Pacific man. Mr. Pearce, who is general purchasing agent of the Seaboard Air Line, was accompanied to the convention by his daughter, Miss Catherine. He was formerly general storekeeper of the Southern Pacific, and while he was holding this office he originated the plan of running supply trains. When he was in San Francisco last spring he first saw the movie of a supply train, and it was at his request that it was brought to the convention.

Louis Greaven, superintendent of motive power of the Buenos Aires Southern Railway, is attending the convention this year for the first time. Mr. Greaven has been through some very trying years on his road during the war. Even though the Argentine was not directly embroiled in the world's conflict there were many patriotic citizens of England and his road suffered particularly from the loss of men who went to the war. In addition to that the Argentine, as is well known, has suffered to a large extent from labor troubles. This, with other things, such as a public demand for excellent service, has made a terrific drain on the railway forces there. Mr. Greaven tells also of the great trouble the Argentine roads have had in getting coal. At present locomotive coal costs about $40 a ton, and for a while during the war it was only possible to obtain 25 per cent of the quantity required. This necessitated converting the engines to burn wood, of which the Argentine has a large supply. The wood is of such a quality that two tons is the equivalent of one ton of coal. It was necessary to run branch lines 100 miles into the forests in order to bring out this wood, and the Buenos Aires Southern drew its wood from seven different sources of supply. This railway has 700 locomotives, is 3,700 miles long and has a 5 ft. 6 in. gage. It runs a highly specialized service to a seaside resort 300 miles from Buenos Aires, and during the season trains of twenty sleeping cars are operated in four sections.